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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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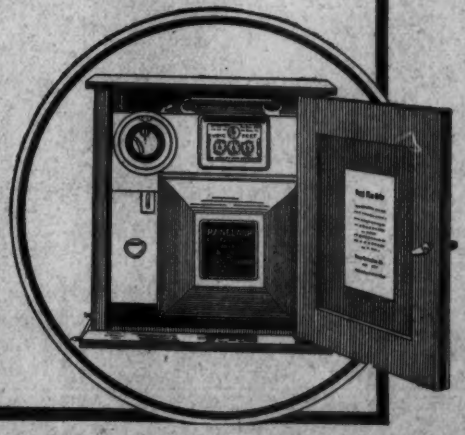

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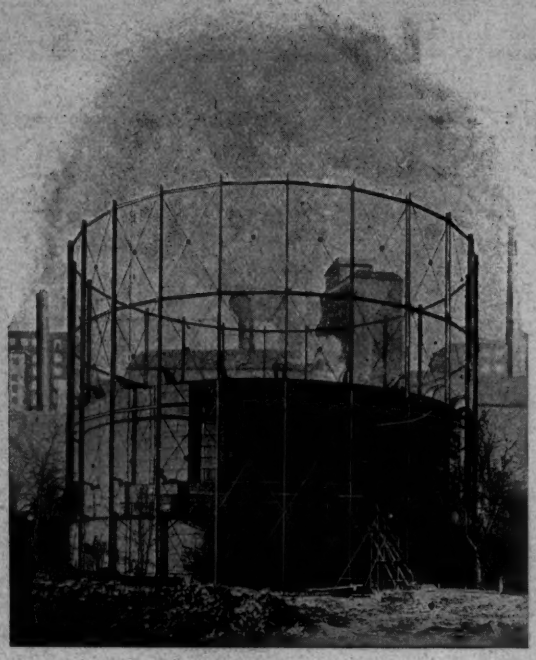

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VOL. CLXIII., No. 3149.] WEDNESDAY, SEPTEMBER 19, 1923. [75TH YEAR.

EDITORIAL NOTES.

The National Gas Exhibition.

THE National Gas Exhibition in the Bingley Hall, Birmingham, was opened on Monday afternoon by the Right Hon. the Lord Mayor of Birmingham (Alderman Sir David Davis), who is the President of the Exhibition. He was supported by Mr. Neville Chamberlain (the Chancellor of the Exchequer), Mr. D. Milne Watson, D.L., the President of the National Gas Council, and Sir Arthur Duckham, representing the Society of British Gas Industries. It was a particular honour that Mr. Chamberlain should have been present on such an occasion, and highly fitting, seeing that his revered father was the first Chairman of the Corporation Gas Committee, and he himself has been a member of it. Many other men were there who stand for the varied interests and elements comprising the vast work of the industry—in fact, the personnel of the audience at the opening emphatically accentuated the goodwill, fervent wishes, and earnest expectations from all sections of the industry. For all this the Executive Committee (formed from the Midland Commercial Gas Association), the Chairman of that Committee (Alderman John Henry Lloyd, M.A.)—who is also the President of the British Commercial Gas Association, and the Chairman of the Birmingham Corporation Gas Committee—the Deputy-Chairman of the Executive Committee (Mr. A. W. Smith, the General Manager and Secretary of the Gas Department), and the energetic Hon. Secretary (Mr. R. J. Rogers) are, we are sure, truly thankful. Those who have been concerned in organizing the exhibition, or who have contributed to it in any shape or form, indeed deserve all the reward which the industry can give them—especially in the way of promoting visits to inspect the wealth of result from their labours. There is a comfortable feeling that they will get this. When we look down the lists (printed in the forepart of the catalogue) of the organizations giving their patronage and support—not only organizations associated with the industry, but several whose work is concerned in the application of the industry's primary product, and therefore in the advancements in its utilization—of those of high rank (even His Majesty the King) in all walks of life who are also patrons, and of the gas undertakings supporting the exhibition, we have confidence that there will be much travelling of the men of the industry to and from the famous Midland city during the two-and-a-half weeks' run of the exhibition, and that many parties of gas consumers will be taken to witness the extensive demonstration of gas progress. From all quarters of Great Britain, Birmingham is an accessible place. To say the least, it was a fine conception that has brought into being in Birmingham this first National Gas Exhibition outside London; and, as Alderman Lloyd's "Foreword" to the Exhibition Catalogue says, "it is fitting that it should be taking place in the area "in which Murdoch made many of his early experiments in "gas lighting."

The exhibition is a demonstration not only of the progress of the gas industry in the production of more economical and efficient appliances, and the extension of the range of the applications of gas, but of the tremendously greater service that it can render in ameliorating the conditions of life and in introducing greater efficiency into our domestic and industrial systems. More efficiency in the home and industrial establishments, and better health through the ridding of the air we breathe of the polluting and sun-veiling emanations of chimneys, are matters of growing concern and importance. We heartily congratulate the organizers of the exhibition upon the diversity of the display, and upon the details of its general setting. The exhibits extend through the highways and by-ways, and penetrate into all the nooks and crannies, of gas application. The co-operative exhibit of the Midland gas undertakings in the shape of model rooms, and the exhibits of the Birmingham Corporation Gas Department, will be found especially attractive to visitors; the housewife will be interested in the working laundry and the cooking demonstrations; and men of industry and the public generally will be attracted by the expositions and demonstrations of the heat treatment of metals by gas, the making and testing of gas-meters, and the production of incandescent mantles. Educational work in the shape of lectures, competitions, and visits have been arranged; and historical relics and records that have been preserved through the years of the industry will be seen. There is a comprehensiveness about the exhibition which is good; the planning claims like description, and so does the choice of appointments in the model rooms. Refinement and utility are combined there in abundance. The old idea that, however great the utility of gas, refinement was inevitably a stranger to application, has long since been exploded. Even electrical critics have had to admit the excellence of design and artistic merit of modern gas-lighting fittings, and of similar virtues, consistent with use, of other gas-consuming appliances. "Excellent and complete" will be the universal verdict upon the display at Birmingham.

A report of the proceedings at the opening of the exhibition, and an account of the exhibits, are published by us to-day. The descriptive matter constitutes a substantial part of this issue, and attests the far-reaching character of the display. The days of the exhibition will pass quickly. To those responsible for the administration of gas undertakings throughout Great Britain, we say: Make the best possible use of this demonstration of gas progress and application while the opportunity offers.

Exhibitions, Old and New.

THE Gas Exhibition at Earl's Court in 1905, and that at the White City some ten years ago, are events still well in the memories of many of us. They were wonderful displays in point of magnitude, and they demonstrated the efficiency of those days in the utilization of gas. There were prior exhibitions—many of them—of national and local, but less pretentious, character. They, like the great exhibitions at Earl's Court and the White City, attracted well the attention of the public; and they all served the good purpose of contributing to the progress of the industry's business. Looking back at them, and comparing them with present conditions, there are three things that impress us. First, there is the change that has come about in the style of the exhibitions; secondly, the ideas of the public as to attractiveness have undergone such change that what was magnetic then would not be so now; and, thirdly, in the apparatus and appliances that the industry has to show to-day, the thermal and working efficiencies, and the range of applications, have taken a remarkable leap upwards.

This last point means that the base of the industry has been extended and deepened; and that the advance in efficiency has conferred upon it additional stability, potentiality, and power of resistance to competition, which simultaneously has grown in strength—likewise through developments and higher efficiency. Hence the necessity for increasing effort to make progress in the capabilities of those things which contribute to our own industry's standing and prestige. We cannot afford to remain passive; there must ever be moving forward. When such a collection of gas appliances as has

been assembled in the Bingley Hall, Birmingham, is seen, there is naturally gratification that science and invention have enabled so much to be accomplished. But from past experience we are conscious of the fact that it does not do in these matters—this must be emphasized by reiteration—to rest on our oars and be thankful. We know our competitors are at work, and will achieve further gains; but this knowledge should not be, and, we are happy to say, is not, among our gas appliance manufacturers and the men of the gas-supply industry, the only incentive to endeavours to reach greater altitudes both in performance and applications. We are not now content with only cooking for a family; we can cook for many thousands of people in one establishment. We are not content with the heating of one or two rooms in a house; we are after the abolition of the old-fashioned smoke-emitting chimneys. And the same with water-heating, motive power, and industrial heating. May such discontent continue! It is good. But the successes of to-day can only be taken as the starting-points to new endeavour. We have ideals regarding what is required; but those ideals are somewhat limited by current knowledge. Hence the value of the research work that is proceeding for the industry in the matter of gas utilization at the Leeds University and other seats of learning, and in the laboratories of our manufacturers and elsewhere. As there is new revelation, so our ideals grow. There is confidence that the best that can be exhibited now—good as it all is—will not comply with the standards of (say) ten years hence. Our confidence is great. We have but to look back at the exhibitions of ten, twenty, and more years ago to see how much of what was then counted good is obsolete to-day; and what was then thought impossible has been given actual existence. In that fact is the justification for holding a big belief regarding further progress in the future.

We remember with affection and interest the exhibitions that used to be held many years ago, with (viewed from the standards of to-day) all the imperfections that they demonstrated. We can picture again in our minds the stands at those displays packed like well-stocked shops with as many different types of appliances as the space could be made to contain. Congestion was so great that examination of each type was utterly impossible. Ingenuity and ideas in demonstration and display did not stand high in those days. But the public were attracted. There was something novel in free shows of the kind; and they did good, even though design and performance of the appliances were of an order that we have since discarded. It is educational to-day to have specimens of the goods of long ago side by side with their modern successors, to show the improving strides that have been effected. In those old exhibitions there was very little demonstration of working efficiency. If the place of the exhibition was large enough, there was occasionally a little music. But since then, as we have said, the ideas of the public have undergone a vast change. They want life; and they want to be entertained. These are to-day the accompaniments of the plans to arrest at exhibitions of utility the interest of a large section of the public. If we look at the doings in the worlds of amusement and recreation, we see the mutations there—there is more spirit and more "go." What the public want, the public will have. If that is the case in those parts of life, how much more is it so in connection with shows having utilitarian objects. This does not apply to the public generally. There are many men and women who are always seeking fresh knowledge. For them, there is hardly any need for exhibitions of gas appliances, except that they give opportunities for inspecting a variety of types which they would not otherwise have had brought to their notice. And seeing enables them to talk, and the talking to advertise. But those whom we most desire to get hold of are the people who would not be attracted by the old form of display—the people who must have life and demonstration.

In a small way at local exhibitions a dozen or so years ago, and at the White City a decade ago, a remarkable change set in. We passed from accumulation to types; and from inactivity to demonstration in furnished rooms and fitted kitchens and bathrooms—all at appropriate times showing effects and operating efficiencies. This met the taste of the public; and there have been developments since. The art of demonstrating efficiency, and attracting the part of the public whom it is the most desirable to attract, had been learned by the gas industry; and further new conceptions have come to our aid. The old order has changed; and with great advantage—not only in lighting with graceful fittings and high-efficiency burners in suitable surroundings, but in the demonstration of cooking, heating, hot-water supply, and industrial applications. This induces a reminder of the fact that it was in the days of the old exhibitions that cooking appliances, with their then defects, made such vast headway in adoption. This is an emphatic proof that then it was not heating efficiency so much as the convenience and labour-saving conferred that were their chief recommendations. But we can no longer solely rely upon these points of commendation. There are competitors in the field—claiming the attributes of convenience and labour-saving. With these there has to be reckoning. And now, through the higher prices of gas, the public have commenced to take more account of the question of economy and efficiency. This is a good thing, as the better economy and efficiency appliances will show more and more to advantage as the price of gas descends. In gas lighting, higher efficiencies, and therefore economies, are shown at the modern exhibition; in cooking, big advances in economy have been made recently, particularly on the hotplate; and the efficiency of the gas-fire in every respect leaves the types of not many years ago stranded far abaft. The same can be said of gas-engines and industrial appliances. All along the line, in fact, progress has been made, and of a very pronounced order. This is what is seen in Birmingham; but efficiency in the apparatus and appliances themselves is not the one thing that strikes the attention of the observer who is competent to make comparison with the past. Besides, there is the higher efficiency that now obtains in arresting the interest of the public, in educating them, and in proving to them that things are honestly as represented. Because of this, we wish the Bingley Hall Exhibition, and all other efforts of a like character, an abundant success.

Lighting Business Retention and Extension.

The discussion on the subject of the retention and extension of the gas-lighting load, which took place at the meeting of the North British Association of Gas Managers, as reported in our issue last week, exhibited a diversity of views; but almost unanimously it was agreed that there must be a change in practices, which will bring gas undertakings in this particular regard into conformity with the requirements of the times. We may remind readers that the question was brought before the Association at their spring meeting by Mr. E. Edison Stones, and at the recent meeting the discussion was opened by supplementary contributions by Mr. James Bell and Mr. John Wilson. The trio were agreed that a new policy is necessary where not already in existence, and that the circumstances point unmistakably to free maintenance of lighting equipments. Paid maintenance—as the authors of the papers and some of the speakers declared—has proved a failure. It is not universally adopted; and there is little protective use in having burners well kept in some houses, if the examples do not tempt other people to commit their equipment to similar treatment. We cannot ignore the fact that the electric lamp, although it gradually loses in efficiency, requires no maintenance; and the light can be switched on and off at will. These are conveniences, against which we can set our lower intrinsic brilliancy, and good quality and distribution of light. And as to switching on and off, we have arrangements for doing this; but it is considered there is room for improvement. There is no gainsaying the fact that we have in the competition made all too little use of our good qualities; but, apart from this, it has to be recognized that many gas consumers do not want to be bothered with the cleaning and maintenance of their lights, even though told that they can, by so doing, maintain a high efficiency. Because of this, some people adopt a light which gives them less personal trouble. These are facts that have to be kept well in mind in considering this question of the policy to pursue. There is another matter which must not be overlooked. A good deal of misconception resides in some minds as to the position of the foundation of the gas industry. It is at the business end, and not at the producing end. The producing end is the servant of the business end; and the business end expects from the producing end the best service at the lowest cost. It depends upon sales whether a gas undertaking exists at all; on them it depends whether or not the undertaking grows; to some considerable extent it depends upon the growth of business whether the best economies can be achieved in the production of gas. This being so, let there be no avoidable neglect at the business end.

Disappointment was expressed that the authors of the papers had not been a little more constructive in their recommendations. We do not see where they could have been, in the ten minutes allotted to them, unless they had given precise and detailed definition to "maintenance." It says something for the trend of expert opinion when all three authors, and several speakers in the discussion, alighted on maintenance as the one thing desirable for the preservation and extension of the lighting load. When the industry reaches a definite policy, which will (as Mr. Bell says) establish to its fulness the competence of gas as a lighting agent, then each undertaking can best determine details to the satisfaction of its own conditions. There is confidence in the minds of the authors of the papers and the various speakers that gas lighting has before it a long life, if only we work for it. That is the important matter. There are, however, those meticulous ones who think a gas undertaking will be assuming a new responsibility (this much was gathered at the meeting) to which apparently in their minds they have given all sorts of hideous shapes. For this we do not think there is any reason. It is do or die so far as much of the lighting business is concerned. And we are confident a great majority of the gas undertakings of the country are not prepared to sacrifice the business with their best lighting customers if they can possibly avoid it. But they would do so by continuing a *laissez faire* policy.

When we come to consider Mr. Keillor's statement that no less than 40 p.ct. of his total load in midsummer falls between 6 p.m. and 6 a.m. (and, of course, the proportion alters with the change of seasons), we have something significant to ponder. Our competitors realize that lighting is, through neglect (where it exists), the most vulnerable part of the gas business. We must strengthen that part. Once the competitors get a foot into the consumer's doorway, their present policy is to try to get in their whole body—first by small applications; then by larger ones. We cannot blame them; but we must not concede anything. We must accept the new and competitive conditions as demanding—not merely inviting—a revision of policy. The old ways will not do for the new conditions. They must be brought up to date and to requirement. We know the causes of lighting inefficiency; we know they occasion loss. Then what really sane argument can be advanced against doing something to eliminate them? If the appliances by which gas is consumed are not kept in proper order, then gas suffers. Furthermore, it is only through maintenance that any effective headway can be made in exterminating shoddy burners and mantles, and in persuading consumers not to purchase them. The power of demonstration of good lighting on fittings previously equipped with poor burners and mantles will do more to advance the campaign against those things which are noxious to the interests of the industry than anything else can possibly do. In addition to the saving of business, this eliminating work would be a direct beneficial effect of maintenance. We put this matter of maintenance in the forefront in connection with the lighting business. There is the question of the cost of free maintenance. How is it to be met? Mr. Stones estimated that it would amount in Glasgow to something like 1½d. per 1000 c.ft. That is not an enormous sum for defence. It would mean one-fifth of that per therm on a 500 B.Th.U. gas, or 0·3d. In this relation, the old question arises as to the position of the large consumer, who, if he knew of the charge being included in the price he is paying for gas, might protest; but, as Mr. David Vass pointed out, the objection so far as large consumers are concerned can be met by discounts according to consumption.

There was, as previously remarked, complaint that the papers did not go far enough in constructive suggestion—that the authors had their minds riveted on the one point, maintenance. In the discussion, suggestions were made which were incidental to maintenance, but cannot supersede it. Enlarged service-pipes and governors will not clean incandescent burners. They may reduce the need for adjustment. Nevertheless, the President raised the important point as to the adequacy of service-pipes, and having full control of them up to the meter, and not merely to the building-line; and Mr. Keillor agreed that it is a duty of the gas suppliers to see that service-pipes are maintained in good and adequate condition. We must look at this question broadly. No one can do business efficiently unless he has proper means of carrying it on. And it is sheer folly to develop the uses of gas in a house if the service-pipe is not of sufficient calibre to supply the probable maximum need for B.Th.U. at one time. Where there is not control by the gas suppliers of the service-pipe up to the meters, property owners are not all unmindful of the fact that, unless there is proper provision for modern conveniences, their old houses will lose in reputation and letting ability. Of course, there cannot be compulsion; but it is often found that property owners are willing to share expenses, in order to effect an improvement. But experience sometimes tells a better tale than much talk round about a question. Mr. Vass had a piece of striking experience to relate. In a defined district in Perth, where there had been complaints as to the inadequacy of supply, the service-pipes were renewed and rearranged. This involved an expenditure equal to about 2d. per 1000 c.ft. for a few years; but now there is complete satisfaction from that area. Is that satisfaction worth the price? There is only one answer. It was a splendid investment, which is daily bringing in profit. We approve of investments of the kind. The suggestion was also made as to the fixing of governors to each service-pipe. This is a polemical matter; and as was seen during the Departmental Committee's inquiry into therm charges, some gas engineers are doubtful as to the effect justifying the cost.

However, the broad fact remains that, in the matter of the lighting business, the best protection is to be found in the general adoption of the policy of free maintenance—inspection, cleaning, and regulation. The number of gas-men who so think is growing; we hope to see an increase in the rate of growth.

Works Costs—Combined Gas and Electricity Supplies.

THE members of the Eastern Counties Gas Managers' Association saw and heard a good deal of the doings of the Tottenham Light, Heat, and Power Company last Wednesday. Their works, methods, and everything else concerning their operations are a never-failing source of interest and instruction. Originality stamps their affairs in many ways both on and outside the works. From men and not from things, originality springs. From the time we first made the acquaintance of the Tottenham Gas-Works when they were small (now they are the premier ones in the Eastern Counties) they have been in official charge of a Broadberry—father and son—until latterly, when Mr. H. C. Smith succeeded as Chief Engineer Mr. A. E. Broadberry on his elevation to the Board. For many years there has been in the chair of the Board of Directors a hearty supporter of all progressive proposals, in whatever quarter they might lie. There was Sir Corbet Woodall, then Sir Daniel Ford Goddard, and now Mr. Henry Woodall. Such a technical combination could not fail to make the passing decades stout with gas-supply development, and that on economical lines. The Eastern Counties Association were the guests of the Company on Wednesday; and the day was a full, instructive, and happy one. Except for one item and the general business at the meeting in the afternoon, the Company "filled the bill" for the day. There was a visit by road from London to the large works in Willoughby Lane, Tottenham; return was made to town, and luncheon was served at the Holborn Restaurant, at the invitation of the Chairman and Directors; and at the meeting, the Chief Engineer contributed a paper on works costs. The visit was well timed; for a large amount of constructional and renewal work is in hand—among the former a 6¾ million c.ft. gasholder was seen nearing completion. The visit was an excellent prelude to the paper by Mr. Smith. It was a day of variety. Even the paper that Mr. J. R. Bradshaw, of Retford, contributed was appropriate to the day, seeing that he advocated the combination of gas and electricity supply. In such combination, the Tottenham Company were among the pioneers. They would have been pleased to secure electricity authorization for their whole district if the higher powers had not refused it, and so they had to be content with the supply in the Wood Green area.

When one has to deal with such a large undertaking as that at Tottenham, the question of maximum economy and control is a highly important one. The more extensive a works and area of supply, the greater the need for an efficient system of control; for the greater the extent, the greater must be the devolution of responsibility. Of course, maximum economy and control are important in gas undertakings of any magnitude; and particularly in these days

of high costs for materials, goods, and labour. It may be platitudinous, but it is nevertheless true, that, in connection with any business, anything expended beyond requirement is waste; and, in the case of gas supply, all such waste falls upon the cost per therm. We have seen figures which disclose a remarkable aggregate saving in expenditure through the adoption of the control provided by a well-organized costing system, both on the works and in the district. At Tottenham, they have a works costing system which Mr. Smith described in his paper; but a less detailed method for the distribution area, though, with modifications, something of the same kind as the system applied to the works might, if necessary, be adopted for the district work. However, as to works costing, one does not require over-elaboration; but what should be aimed at is a system that is effective for the purpose, and at the same time simple. The idea is to have readily available a more exact knowledge as to costs than obtained previously; but "ready availability" is not to be secured by over-elaboration. For works of the size of those at Tottenham, the system explained and illustrated by Mr. Smith cannot be regarded as excessive; but for a smaller works, the limitations imposed by the staff alone would demand its abbreviation. Yet for Tottenham, the outlined plan possesses the characteristics of simplicity, accuracy, and elasticity. But however good a system may be, one must always take into account, in using the data for comparative purposes, various factors that may be disturbing influences. Manufacturing costs, for instance, vary from year to year—not always through a rise or fall of efficiency, but through the rise or fall of the costs of materials. Plant costs, too, may vary from year to year through repairs and renewals being higher one year than another. And in making comparison of the upkeep costs of (say) one carbonizing system against another, the comparison has to be qualified in favour of the system which is the most productive. There are many things which introduce themselves in utilizing a costing system for comparative purposes. The conditions must be on all-fours to make data really comparable; and when they are not exactly alike, then there has to be qualification in order to arrive at a fair comparison. Even where comparison is made with the same plant, the factors of quantity, quality, cost of materials, &c., and state of repair individually or collectively all change; and consequently, where possible, comparison between extended periods is the safer plan. But if all works cannot adopt the full details of the costing system as described, much good can be effected by a partial system. As the statistical record grows in any works, so will its value. We will not go into the details of the system in operation at Tottenham. The paper is reproduced in full in later columns; the discussion offers, apart from the commendation, sufficient comment.

Experience of a considerable character has been had by Mr. J. R. Bradshaw, of Retford, in the running of combined gas and water undertakings. And this experience, and a commonsense examination of the question, has (his paper shows) convinced him that the operation in combination of gas and electricity undertakings is a wise economic proceeding, especially for small towns and those of moderate size. The responsible administrators of gas undertakings so situated should ask themselves three questions. First, Is there a demand here for electricity? If the answer is in the affirmative, then the second question is: Is it likely that an undertaking will be introduced specially to satisfy that demand? Of the nature of the reply to that question, there can be little doubt. Where a demand exists, in time a way will be found to meet it. The third question is: Can two undertakings doing the same business, but with different agents, be run profitably in the town? Assuming the answer is in the negative, and it is realized that a certain amount of business will have to be forfeited by the gas undertaking, the then further question arises, Can the two undertakings be run together profitably? It must not be assumed that they can be; careful investigation must be made. But certain it is that the two concerns can be run more economically in combination than separately. That is the view at Retford. The Corporation there have resolved upon an electricity supply scheme; and Mr. Bradshaw, in his paper, gives reasons for the decision to operate it in combination with the gas undertaking. The works will then, in truth, be The Retford Light, Heat, and Power Station. An Order has been applied for; and, if granted, electricity will be provided from gas-driven generating sets at the gas-works. We are of opinion that Retford is doing the right thing. So thought most of the speakers in the discussion, including Mr. Broadberry with his experience of dual supply. Mr. P. D. Walmsley, of Great Yarmouth, rather favours the generation of electricity by private gas-driven sets. So do we, where an electricity supply is already in existence. But it is those places—and they are many—that have no supply of current to which Mr. Bradshaw directs attention; and there is little question that sooner or later it will be found that the communities in such towns can be supplied to greater advantage by gas and electricity run in combination than by distinctly separate systems.

Lower Priced Therms.

The Widnes Corporation are now supplying gas for domestic and industrial purposes at a price per 1000 c.ft. which is equivalent to 5d. per therm. Consumers of upwards of 3 million c.ft. obtain a supply at a price which works out to 4·58d. per therm; while for motive power and furnace purposes, the charges represent prices running from 4·17d. to 3·13d. per therm according to quantity. The Bath Company are also down to 5d. per therm. Belfast is now selling gas of 460 B.Th.U. for lighting purposes at 2s. 4d. per 1000 c.ft., which is somewhere about 6d. per therm. Recently we were congratulating the Hornsey Gas Company on their decision to reduce the price of gas, as from the September meter readings, to 8d. per therm, which, without change in other quarters, would have made their charge the lowest in and about London. The South Metropolitan Gas Company, however, have now announced another ½d. per therm reduction, which will make their charge also 8d. per therm. There will be rueful faces among the electrical people to hear of 100,000 B.Th.U. being sold the gas way for ordinary purposes at prices such as 5d. to 8d.; while for 5d., at 1d. per unit, only 17,100 B.Th.U. can be purchased the electrical way, at 6d. 20,520 B.Th.U., and at 8d. 27,360 B.Th.U. At 2d. per unit, the potential heat energy would be halved. That is not a healthy position for the competition of electricity for heating purposes.

A Topical Mélange.

It will be seen from the minutes of the last meeting of the Executive Board of the National Gas Council published in this issue that they are engaged upon several matters of exceptional interest. The Board of Trade have drafted clauses relating to the supply of gas for industrial purposes; and the Executive Board have evidently matters in connection therewith which they would like to discuss with the central authority. The question of procedure under section 10 of the Gas Regulation Act is still a sore point; and there is good reason for it. As to chemical works regulations under the Factory and Workshop Act, the Executive Board are of opinion that exemption should be issued to small gas undertakings, both as regards sulphate of ammonia and tar dehydration plants. To press this matter, a deputation from the smaller undertakings are to wait upon the Home Office. Sample standard cookers are now being sent to gas undertakings in rotation according to the date of order. We ought soon to be hearing of trial results. The position of public utility companies in respect of Government financial assistance in order to help in the relief of unemployment is being investigated. The Executive Board have also, on behalf of the gas industry, certain amendments to submit for consideration in connection with the Smoke Abatement Bill. They have their hands pretty full!

Household Coal.

The coal merchants have not been long in putting into operation their (shall we call it?) threat to increase the price of coal by 1s. per ton. There has been rather a better demand since it became known that their patience with the public was almost exhausted. The little reduction with which they offered to induce householders to stock during the summer their coal-cellars having largely failed, they have restored prices by 1s. per ton, and anthracite nuts have now to bear an addition of 4s. These are the fines the public have to pay for recent apathy. A member of the Coal Exchange says that the public have only themselves to blame. If, he added, they had bought in July or August, an abnormal rush would have been obviated, and prices would not have stiffened. On the other hand, gas prices are being reduced, which will not help the feeble propaganda of the coal merchants against their labour-saving, non-smoke-producing competitor.

Good Advice.

The Royal Commission on Fire Brigades and Fire Prevention made, in their report, a number of practical recommendations. Among them is the excellent advice that electrical installations should be periodically inspected and tested in the case of all old buildings, and defective installations, so far as practicable, should be brought up to modern standards. Attention is also drawn to the need for examination of electrical installations in the older Government buildings. We have heard of outbreaks in them—and in some that are not of fireproof construction. Only the other day a misguided friend of ours returned from holidays to find that the caretaker had been almost frightened out of her wits through a short-circuit and the damage it had occasioned to the contents of a room. Our friend was not pleased. That is a case in which a little overhauling of the installation would not be amiss. Inspection and overhauling of electric wiring should be frequently made; stout gas tubing seems to have everlasting life.

Price of Motor Spirit.

There have been rumours of a further reduction in the price of motor spirit. A newspaper correspondent who has been making inquiries cannot find any corroboration of this. The reply he obtained from the National Benzole Company was that no reduction of the price had been notified, and any immediate alteration was improbable. Since 1914, the price of petrol has varied as follows: 1914, 1s. 7d.; 1916, 2s. 2d.; 1920, 3s. 8½d.; 1920 (August), 4s. 7½d.; 1921, 3s. 5½d.; 1921 (May), 2s. 11½d.; 1921 (August), 2s. 5½d.; 1922, 2s.; 1923 (July), 1s. 8½d. When in July last the price was reduced by 3½d. per gallon, it was shown that it meant a saving to consumers in the United Kingdom of over £4,500,000 a year, at the then rate of consumption.

Scientific Defence.

We have been too busily engaged on other matters to spare time during the past week to read the proceedings of the British Association, including the remarkable address of the President (Sir Ernest Rutherford) on "The Electrical Structure of Matter." The day before this was delivered "A Scientific Correspondent" of "The Times" contributed an article advocating that the State should appoint and support a small Committee of Scientific Defence, whose duty it would be to watch the developments of science throughout the world, and to advise Government Departments as to possible applications of new discoveries. The relation of science to national security is all-important. How important is well illustrated by the position that Germany had attained in the dye, drug, and explosives industries before the war, while other countries were lagging far behind, only discovering their position by the temporary, but all too long, supremacy of Germany. The "Scientific Correspondent," referring to the sources of the world's energy, points to the rising cost to the consumer of all kinds of fuel; and this he believes to be due to the fact that "the world's supply is not expanding to meet the demands on it." But costs are not rising; they are descending. They did rise to a height that aggravated the hardships from which the world has been suffering; but the supply of coal at any rate is a great distance from exhaustion. The future demand for fuel, it is submitted, may be met in two ways—by economies in utilization, or by the realization of the hope of physicists that the vast reservoir of energy locked up in the constitution of matter—that is, sub atomic energy—may be released for human purposes. The industrial applications of such a discovery, if possessed by a single nation, would give command of the world. Much pioneer work is being done in the disintegration of the elements and the exploration of the atom. From this may come a method of building up the simpler atoms into the more complex atoms of the higher elements, with a consequent release of vast supplies of energy. What may seem remote may be near. The practical application may come at any time. No one can tell. But what troubles the "Scientific Correspondent" is: If it comes, and in this country, is there any certainty, or even probability, that it will remain in Great Britain? This, and much else, is all a prelude to the suggestion as to the appointment of a small Committee of Scientific Defence.

The Largest Coal Producer.

From time to time, statistics are published regarding the world's coal output. The National City Bank has been interested in examining the subject, with a view to ascertaining the percentage contribution of the United States. As would be expected, the result shows that the United States take the lead in production. The word's coal output, which stood at 1,141,600,000 short tons in 1910, advanced to 1,478,000,000 tons in 1913; then dropped to 1,170,000,000 tons in 1915, slowly advancing to 1,306,000,000 tons in 1918, and stood at approximately 1,332,000,000 short tons in 1922. The share of the world's output which the United States supplied in the years immediately preceding the war averaged 38 p.ct., advancing to about 47 p.ct. in the closing year of the war, then dropping to 40 p.ct. in 1920, and but little more than 35 p.ct. in the year 1922, in which the United States production was the smallest since 1908. The United States, despite the abnormally low production of 1922, still far outranks the other coal-producing countries of the world. According to the geological survey, the 1922 output of the half-dozen biggest coal-producing countries of the world, stated in metric tons, was: United States, 417,000,000; Great Britain, 256,000,000; Germany, 141,000,000 of coal and 137,000,000 of lignite; France, 32,000,000; Japan, 25,000,000; Poland, 24,000,000; and Belgium, 21,000,000. The United States has been constantly, since 1900, the largest producer of coal in the world.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

The Central Executive Board of the National Gas Council met at No. 30, Grosvenor Gardens, S.W., on the 11th inst.—Mr. D. Milne Watson in the chair.

GAS REGULATION ACT—SECTION 10—SUPPLY OF GAS FOR INDUSTRIAL PURPOSES.

Clauses drafted by the Board of Trade in connection with the supply of gas for industrial purposes were considered. After discussion, the matter was referred to the Chairman and Executive Officers to see the Board of Trade thereon.

GAS REGULATION ACT—PARLIAMENTARY PROCEDURE IN CONNECTION WITH ORDERS UNDER SECTION 10.

The President of the Council reported the result of his interview with the Board of Trade on this matter; and it was decided (1) to watch the procedure with regard to the various Orders under section 10, and (2) to take such steps as the Council deem necessary to protect the industry as a whole.

FACTORY AND WORKSHOP ACT—CHEMICAL REGULATIONS AND EXEMPTION CERTIFICATES.

The interviews and correspondence which had taken place between the Council and the Chief Inspector of Factories with regard to granting certificates of exemption from the above regulations to small gas undertakings were reported. It was agreed that the Home Office should be informed that the Council felt most strongly that exemption certificates should be issued to small gas undertakings, both as regards sulphate of ammonia plants and tar-dehydration plants. A deputation, consisting of representatives of the smaller gas undertakings, was elected to wait upon the Home Office, in order to press for certificates of exemption in the case of all small undertakings.

LOCAL BUILDING BYE-LAWS.

It was reported that a meeting of the Committee of the Council, who were proposing to interview the Ministry of Health with regard to this matter, was to take place that afternoon.

STANDARD COOKERS.

It was reported that a meeting of the Committee of the Council dealing with this matter had taken place that morning; and their recommendations were submitted to the Board, and were approved and adopted. Sample cookers will be dispatched during this month to undertakings who have placed orders for the same, in rotation according to the date when the order was placed.

RELIEF OF UNEMPLOYMENT—GOVERNMENT FINANCIAL ASSISTANCE TO PUBLIC UTILITY STATUTORY COMPANIES.

The attention of the Board was drawn to the fact that the Government intended to offer similar financial assistance to public utility statutory companies in this matter as had been offered to municipalities. It was reported that, in reply to an inquiry from the Council, following upon the publication of the Second (Interim) Report of Proceedings of the Unemployment Grants Committee, a letter had been received from this Committee stating that "in cases where dividends of undertakings are already limited by statute, further provisions as to limitation do not, of course, apply." The Council had been pressing the Unemployment Grants Committee for particulars and conditions under which the proposed grants will be made, in order that gas com-

panies might be in a position to decide whether they could avail themselves of Government assistance.

Smoke Abatement.

Reference was made to the Bill now before Parliament. After full discussion, it was agreed to put forward certain amendments to the Bill, on behalf of the gas industry.

National Gas Exhibition, Birmingham.

It was announced that this Exhibition would be opened on Monday next, and the hope was expressed that it would be well patronized by everyone interested in the gas industry. It was stated that the Council's standard cooker would be on show at the Exhibitors' Club, where any member of the gas industry would be able to view it.

PERSONAL.

Mr. E. Fifield has resigned the position of Works Superintendent at the Great Harwood Gas-Works of the Accrington District Gas Board.

Mr. J. Wilfred Drake, head of Drakes, Ltd., has consented to stand as the Conservative candidate for the Illingworth Ward in the forthcoming municipal elections at Halifax. The firm's undertaking is in that ward.

Mr. Joseph Kirk, Chairman of the Morley (Yorkshire) Gas Committee, who has been a member of the Town Council for nearly nineteen years, has accepted a unanimous invitation to be the next Mayor.

Mr. George Walker, Chairman of the Bradford Corporation Gas Committee, has returned to municipal duties following a somewhat lengthy illness, and was heartily congratulated by resolution at a meeting of the Committee last week.

OBITUARY.

It is with deep regret that we announce the death of Mr. William John Leonard, Senior Partner of Messrs. Carless, Capel, and Leonard, which took place at Llandrindod Wells, on the 10th of this month, after a prolonged illness.

The funeral took place last week of Mr. James Oakes, of Blackpool. Deceased, who was employed at the Blackpool Gas-Works, was formerly an inspector in the Manchester Corporation Gas Department. As the cortege arrived at the cemetery, it was met by some 36 employees from the gas-works, who attended to pay their last respects.

ELECTRICITY SUPPLY MEMORANDA.

If reiteration in the Electrical Press is a dependable sign of the lack of preparation on the part of electricity supply undertakings for the winter season heating business, then there must be some reason for the disinclination of the latter to make preparation. The only direction in which there appears to be any real or fairly general effort is that of lighting—the part of the business from which the highest price per unit can be obtained, and which during the winter season is the most regular. Temperatures vary; but the hours of darkness are extending. Heating by electricity is spasmodic, and its cost for continuous use prohibitive. We do not know, but we think it is possible, that this frequent endeavour to boost up the supply undertakings to greater efforts to secure business other than for lighting is due to inspiration from manufacturing quarters; for the producers of things the public do not want in large numbers are mightily sick of the slender demand. It is not to be wondered at. There is no concern that produces electric cookers and fires alone; they generally treat them as a side issue. If they did not, they would be unable to live. It would have paid some of them better if they had never carried their enterprise into a non-paying quarter. However, they have learned by experience that the public are the arbiters in these matters; that if the public will not buy, then all their endeavours to make them do so are of no, or little, avail. There comes a time when the fact has to be accepted. There are undertakings the responsible managers of which find that the gaining of a consumer or two for heating or cooking is no commensurate reward for the efforts, time, and money expended. Hence the disappointment of the manufacturers; hence, too, the reason for the electrical journals trying to stimulate the electricity undertakings into greater action.

Declining Effort.

Lamp Price Reductions.

The electricity undertakings now seem inclined to concentrate on the lighting load. At the prices charged per unit, they know it pays better than a small vagarious demand here and there for cooking and heating during the day time. This has very little effect upon their fortunes; and the business carries with it a fair amount of worry. In every direction—domestic, factory, shop, and street lighting—extra pressure is being applied to get more business; and the lamp makers are helping by reducing the price of their wares. The gasfilled lamps have again been brought down in price. The lower prices cover lamps for 200 to 260 volt circuits and 100 to 140 volt. This is the third reduction made in the price of these lamps since 1920; and now we are told the sales already represent more than half the business done in lamps of the metallic filament class—that is to say, to-day as much business is done in the gasfilled lamps as in the vacuum metallic filament ones. The reductions that have been made vary according to the voltage. The "Electrical Times" summarizes the matter thus: "There is 6d. down on lamps of all voltages taking 30 to 40 watts; the 100 to 130 volt 60-watt lamps also get a sixpence reduction; but the higher volt lamps, which used to be 4s., are now 3s. Reductions from 1s. to 2s. 6d. are to be noticed in the bigger lamps, except the 1500 watt lamp, 200 to 260 volts, which remains at 27s. 6d., and so comes into line with the new price of the lamps of similar size for 100 to 130 volts." The 100 watt (100 to 130 volt and 200 to 260 volt) vacuum "Mazda" lamps have also been reduced from 5s. 6d. to 4s. 6d. It is stated that increased factory efficiency allows of these additional concessions in price, although labour charges remain the same as twelve months ago. Whatever the enabling cause, the reductions are hailed with satisfaction in the industry, because they constitute a good selling point in the campaign for more lighting.

"Harsh Blinding Glare."

An advertisement of the Royal Ediswan "Fullolite" lamp contains some home truths, which it is appropriate to note. It says to the reader: "Your most valued possession is your sight, yet how often do you risk its safety by reading or working under inadequate, or harshly glaring, lights at night? A glaring brilliant light is equally as bad as one that is dim; but the solution to the problem is ready at your service. It is the Royal Ediswan 'Fullolite' lamp. The bulb of opal glass filters out the harsh blinding glare, and diffuses a soft, comfortable white light, restful to the eyes." Later on the lamp is described as "the light without the glare." There is an admission here which will not be pleasant reading for the makers of electric lamps who do not supply them in opal bulbs. "Harsh blinding glare!" Probably 90 p.ct. of the electric lamps—metallic filament and gasfilled—that are sold in this country have plain glass bulbs. It is extremely good of the Ediswan people to advertise in a page advertisement in the "Daily Mail" the harm which the plain glass lamps occasion to the sight; it confirms everything that has ever been said by a gas man on the subject.

Safety!

There have been more fatalities recently through contact with live wires; there have been collapses of electricity supply that have caused inconvenience to those who have put their trust in electricity for lighting and other purposes; and there have been disastrous fires at cinemas. We read that the new picture palace at Walsall, which was erected at a cost of about £120,000, has recently been destroyed by fire. Other than the entrance hall and the cafés, nothing remains of the theatre save the blackened walls and twisted girders. Haggar's Picture Palace at Pontardulais, near Swansea, has been totally destroyed by fire—the damage amounting to many thousands of pounds. The public wonder why these things should be, if electricity is such a wonderfully safe thing. The Home Office have seen fit to frame and issue new regulations with the view to minimizing the danger of fire and panic in cinemas. Need we ask why? *Inter alia*, it is provided that each building must be provided with adequate fire appliances suitable to its character. Within the enclosure there must always be readily available certain specified means of dealing with fire. An additional requirement is that a competent operator, over eighteen years of age, shall be in charge of the enclosure during the whole time the apparatus is in use. In case of need, however, the enclosure may be left for a short period in charge of a competent assistant over sixteen. In view of the risk of panic, in the event of some accident to the lighting, it is provided that the safety lighting for the auditorium and any part of the building to which the public are admitted shall be supplied from a separate source from that of the general lighting of the premises, and shall not be controlled from the enclosure. It is stated that the revised regulations are the outcome of conferences held at the Home Office with representatives of the interests affected and of the principal licensing authorities. The regulations come into force at once; but, in the case of buildings already licensed, they will not take effect until the time for the renewal of the licenses.

A Live Lamp-Post.

The "Electrical Review" reports a "fatality" to a donkey through the vagrant character of electrical current. The authority for the report is a correspondent of "The Times." A number of donkeys, it seems, were grazing on Ealing Common; and they strayed into Gunnersbury Avenue. Of course, they ought not to have done this; but the punishment of one of them was severe. While being driven back to the common, the unfortunate Neddy bumped against an electric lamp-post, and was killed by an electric shock. It is a good thing a human being was not the victim. A telephone message brought electricians to the spot. The lamp-post was found to be very much alive, and had to be isolated. When the donkey fell, a man with a piece of iron rod in his hand touched the animal, one leg of which was still in contact with the post. The man had a nasty surprise.

Electric Salesmen's Conferences.

Gas salesmen will be interested to learn something as to the arrangements that are being made by the Electrical Development Association for the salesmen's conferences in London during the next six months. The meetings will be held once a month, at the St. Bride's Institute. The titles of the papers in the programme are as follows: "The Scope and Object of E.D.A. Sales Conferences," and "Some Notes on the Commercial Aspect of Electric Lighting." "How to Organize and Promote Retail Showroom Sales." "How to Sell 'Heat,' and Problems Related to the Warming of Air and Body." "Advertising in the Electrical Industry in Relation to the Retailer and Contractor." "How to Market 'Hot Water' for Domestic and Heating Purposes." "How We Placed the First Hundred Cookers." ["We" refers to Norwich.] "Electricity the Real Domestic Help." "Selling Electric Power." There is a good variety about the programme; and the subjects for discussion should provide material which will interest the rivals of the electric salesmen.

Fuel Consumptions.

The Electricity Commissioners have issued an analysis and summaries of the returns of fuel consumptions of electricity supply stations for the year to March 31, 1923. The "Electrical Times" has published a concise reference to the returns; and from it we take the following particulars. Returns were received from 532 stations; and of these 451 have been placed in their respective groups—the remaining 81 being: (*a*) Stations not in operation during the whole of the year (23). (*b*) Stations where the entire output was generated by waste heat, water power, &c. (27). (*c*) Stations where the major portion of the output was generated by waste heat, water power, &c. (31). As compared with the corresponding figures for the previous year, the total output shows an increase of 854 million units, or 17·5 p.ct., whereas the total consumption of fuel discloses an increase of 203,637 tons, or 3 p.ct. only. The average consumption of fuel at steam stations was reduced from 3·11 lbs. to 2·78 lbs. per unit generated—*i.e.*, a saving of 10·6 p.ct.; and at oil stations from 2·08 lbs. to 1·72 lbs. per unit generated, or a saving of 17·3 p.ct. The average fuel consumption at gas producer stations, however, showed an increase from 2·64 lbs. to 2·7 lbs. per unit generated, or 2·2 p.ct. Table 3 deals with steam stations, graduated in thirteen groups (A to M), generating from 200 million down to 50,000 KW. each per annum. The most efficient stations in each group are listed thus:

	Station with Lowest Coal per Unit Generated.	Lbs.	Station with Highest Thermal Efficiency.	P.Ct.
A	Newcastle E. S. Co., Carville "B"	1·74	Newcastle E. S. Co., Carville "B"	17 80
B	Newcastle E. S. Co., Dunston	1·91	Newcastle E. S. Co., Dunston	16·50
C	Newcastle E. S. Co., North Tees	1·73	Newcastle E. S. Co., North Tees	17·15
D	Sheffield Cor., Blackburn Meadows. Rotherham Cor., No. 2	1·98	Rotherham Cor. No. 2	16·70
E	Hackney Bor. Council	2·05	Hackney Bor. Council	15·40
F	Brompton and Kensington E. S. Co.	2·42	Twickenham and Teddington E. S. Co.	11·72
G	Finchley U. D. C.	2·82	Finchley U. D. C.	11·20
H	Southern Railway, Southampton	3·18	First Garden City, Letchworth	9·95
I	Horsham U. D. C.	4·08	Urban E. S. Co., Grantham	7·22
J	Electric S. Cor., Falmouth	5·16	Edmundsons Elec. Cor., Dorking	5·62
K	Dawlish E. L. & P. Co.	5·30	Dawlish E. L. & P. Co.	5·45
L	Ross E. L. & P. Co.	10·75	Ross E. L. & P. Co.	2·64
M	L.N.E. Rly., Silloth	3·53	L.N.E. Rly., Silloth	7·61

Our contemporary finds it rather discouraging to note that one group (M) has an average fuel consumption of 30 lbs. per unit generated, and that there are upwards of 100 stations running at average thermal efficiencies of anything from 2¾ to 7¼ p.ct. But one or two stations are working on ordinary load at efficiencies of nearly 18 p.ct. That is something to boast about compared with the past; but an efficiency of only 18 p.ct. is poor compared with the efficiencies of certain other processes. And what about the average efficiency of the electrical supply stations of Great Britain?

Earning Power of Research.—Recently, says "Industrial and Engineering Chemistry," a corporation capitalized at a very substantial figure closed its plants, dismissed its sales force, and practically retired from business. This failure is mainly attributable to the fact that a competitor succeeded in winning and holding certain foreign trade. The successful concern was able to do this because years ago it turned to research and scientific control, whereas the unsuccessful concern, tardy in its recognition of science, was unfortunate in the selection of its scientific personnel, in the choice of its problems, and perhaps did not adequately support a scientific programme. It is another instance of the difference between success and failure—success resting with science.

NATIONAL GAS EXHIBITION NOTES.

Lectures and Demonstrations.

During the run of the National Gas Exhibition at Bingley Hall, Birmingham, a special feature will be made of cookery lectures and demonstrations to be given at 3.30 and 7.30 daily; and, in addition, a series of popular lectures has been arranged.

Last Monday Mr. R H. H. Jolly, M.D., D.P.H., lectured on "Smoke as a Cause of Ill-Health." Sir William Kay, Chairman of the Manchester Corporation Gas Committee, took the chair. To-day at 3 p.m., Miss Nora March, B.Sc., the Secretary of the National Baby Week Council and Editor of "National Health," lectures on "Babies and the Smoke Curse," and will describe the criminal, because needless, waste of infant life which our polluted atmosphere is allowed to cause day by day. "The Romance of Artificial Lighting" forms the subject of a third lecture to be delivered by Mr. W. J. Liberty, a member of the Council of the Illuminating Engineering Society, at 7.30 p.m. on Friday this week, when Mr. F. W. Goodenough, Executive Chairman of the British Commercial Gas Association, will take the chair. At the same hour next Monday, Sir Arthur Duckham, K.C.B., will preside at a popular lecture on "Coal and what we Get from It," by Mr. William A. Twine, A.I.C.—a lecture which will be repeated at 3 p.m. on Saturday, Sept. 29. On Wednesday, Sept. 26, Mrs. C. S. Peel, O.B.E., will lecture at 7.30 p.m. on "Humanizing Housekeeping."

"B.C.G.A."

The last days of the Exhibition coincide with the holding of the Twelfth Annual Conference of the British Commercial Gas Association, which opens on Monday, Oct. 1. It will last three days. The official visit of the Association to the exhibition will be on the Tuesday afternoon (Oct. 2). The programme for the meeting was published last week [pp. 733-4].

Masonic.

In connection with the annual conference of the "B.C.G.A.," arrangements have been made by the Murdoch Lodge to enable those members of the Association who are masons to meet some of their brethren in the craft. The W.M. (Bro. W. M. Valon), Wardens, and Brethren desire to invite all members of the Association who are Freemasons to attend. The meeting will take place on Wednesday, Oct. 3, at 4.45 p.m. in the Grosvenor Room Grand Hotel, Birmingham, and will be followed by a dinner, to which all visiting Brethren are cordially invited. Communications should be made to W. Bro. R. P. Vale, Lombard Street, Stourport, Worcs.

Joint Meeting of Junior Associations and Salesmen's Circles.

Reminder may be given to those members who are taking part in the above, that the railway authorities have agreed to issue tickets to Birmingham at single fare and one-third for the return journey. These tickets are available from Sept. 20 to 24 (both dates inclusive), and are only to be obtained on presentation at the booking office of a printed voucher signed by the Secretary of the British Commercial Gas Association. Through the courtesy of the President and Executive Committee of the National Gas Exhibition, complimentary tickets of admission to the exhibition are being provided for all those attending the joint meeting. We hope the necessary information has already been forwarded to secure vouchers and admission tickets. There is some danger for the last-minute ones.

Advertise the Exhibition Locally.

It will be a good thing this week and next to advertise the National Gas Exhibition in the local papers throughout the Midlands, in place of the ordinary advertisements of gas undertakings. The "Leamington Chronicle" this week has gas mentioned on three separate pages. There is an advertisement of gas-fires on the front page by the Leamington Priors Gas Company. On p. 5, there is one advertising gas for industrial efficiency; and those desiring particulars are asked to communicate with the local gas office or visit the National Gas Exhibition. On the same page, the lectures at the Exhibition are advertised in a striking manner. The preceding page contains news paragraphs referring to the annual conference of the "B.C.G.A."

Supporting Undertakings.

In the "JOURNAL" for Aug. 22, p. 585, was given a list of supporting undertakings, sent to us by Mr. R. J. Rogers, the Hon. Secretary of the Exhibition. The following is the second supplementary list; the first having been published in the "JOURNAL" for Sept. 5.

Bideford Gas and Coke Company.
Hyde Gas Company.
Kibworth Gas Company.
Sutton Gas Company.
Wells Gas Light Company.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

The Education Scheme Discussed.

Last Friday week the members of the above Association foregathered, the President, Mr. D. CLEAVE CROSS in the Chair, to hear an address [see ante p. 749] from Mr. Walter Hole, on the Institution's scheme for education in the gas industry. He helped to elucidate some important points; and a useful discussion ensued, which we were compelled to hold over until this issue.

Discussion.

The PRESIDENT, speaking on the question of matriculation, said it would be rather hard on those who had left school some time, and had not matriculated, to be asked to take matriculation before they could sit for the diploma. It would be almost impossible for many men already in the industry to do this. Were the Advisory Committee going to be lenient in such cases? Then with regard to the thesis as part of the diploma examination, would a paper before (say) a Junior Association be accepted, because, if so, it seemed likely to help the Junior Associations in getting papers.

Mr. HOLE, replying as to matriculation in the case of older men, said the one feature of the scheme was its flexibility. There was no wish on the part of the Advisory Committee to adopt hard-and-fast or cast-iron rules. Every case would be considered on its merits; and while all must agree that a certain minimum standard of general education was necessary, they must also give the Advisory Committee credit for sufficient common-sense to be able to find out whether this standard had been reached, regardless of whether or not the matriculation examination had been passed. As to the thesis, he rather felt that the best course would be for the student to prepare the thesis for the examination, and then present it to an institution for publication. Personally, he regarded the thesis as a most valuable part of the examination. He could imagine nothing more likely to bring good results for the industry than numbers of students searching for subjects of an original character to write about, dealing with their everyday work. The clause regarding this had been drawn very widely; and it was provided also that the widest possible interpretation should be given to it in regard to the suitability of the subject chosen for the thesis. There existed a possible range from the man who had carried out a whole series of original experiments to the one who had studied the various books and wrote a thesis which was more or less a paraphrase of some portions of them.

Mr. S. B. CHANDLER, as a member of the Advisory Committee, was glad Mr. Hole had emphasized the sympathetic consideration which the Committee intended to give to all matters brought before them. He also supported Mr. Hole in his remarks as to the value placed by the Advisory Committee on the help of the Junior Associations in drawing-up the scheme. Moreover, as the juniors were most concerned, they would have to play an important part in administering the scheme. Dealing with one or two general matters, Mr. Chandler touched upon the expense to the students of training for these examinations, and expressed the hope that managements in various parts of the country would help. There was a movement in the direction of assisting students in this matter; and he believed before very long it would be a general thing throughout the country. He was convinced that it would pay the industry handsomely to assist students in the expenses involved. Finally, he mentioned the valuable work done in the past by the City and Guilds of London Institute in regard to examinations in gas engineering, and said the industry would be the last to decry it; but when they considered that there were 1200 gas undertakings in the country, involving a capital of £120,000,000 and employing 60,000 to 70,000 persons, it must be realized that now was the time for the great gas industry to have a standard of education of its own.

Mr. HOLE supported what Mr. Chandler had said with regard to the City and Guilds examinations, and paid a tribute to the valuable work done by the City and Guilds Institute in technical education generally—especially at a time when there was a very barren soil to till. As to financial assistance to students, they would be interested to hear that the matter was being taken-up in various parts of the country. This question of facilities, however, was only half the subject; and he went farther, and claimed that there should be reward for work done in connection with these examinations. No doubt they had seen his communication to the "GAS JOURNAL," in which he had suggested an addition of £5 a year to a student's salary when he obtained the ordinary certificate, and £10 on securing the higher certificate.

Mr. D. J. WINSLOW, Head of the technical classes at the London County Council Westminster Institute, said the chief point of interest in the scheme to him was that there was at last a standardized system of education for the gas industry. So far as the courses for gas engineering and gas supply were concerned, he would like to emphasize the need of physics for the supply man and of chemistry for the engineering man. In his opinion, however, the scheme did not provide sufficiently for those men who had not had practical experience. Most of the students at his classes were men of grit, who were desirous of improving their position; and they were the sort of men who should be encouraged. Very often they were men who were not actively engaged on the works or the district; but they ought to be catered for. He took it that the demand for the matriculation standard was an endeavour to ensure that a student could express himself properly. Examiners had for years complained of the lack of this quality in students. Then a student required commercial knowledge—not perhaps so much in the case of the works man as the district man. There was one matter as to which he did not know whether the Advisory Committee could do anything. Formerly, any person residing or working in the County of London could attend the institutes in the county at certain fees. Now the London County Council had increased the fees to those who lived outside London, with the result that a certain number of students had left. Yet there were not the same facilities in the neighbouring counties as there were in London; and he wondered whether something could be done to relieve those students of the increased fees imposed.

Mr. HOLE said there was no requirement that the student should have practical experience before sitting for the ordinary certificate; but there was such a requirement in the case of the higher certificate. He thought this covered Mr. Winslow's point, to some extent, as to the man who wished to get on, and could not obtain practical experience. If such a student showed special ability in the ordinary examination, it would be up to him to put it to his immediate superiors, and ask to be transferred to another department where he might be able to get the necessary practical experience to sit for the higher certificate. Any chief who was on the look-out for good men would immediately go into the matter. As to commercial training, a special scheme was being prepared for the commercial side of the industry. In regard to the London County Council and fees, he did not think the Advisory Committee would have any claim to jurisdiction in such a matter. It was for the local education authorities to arrange these things; and he did not think that even the Board of Education could interfere.

Mr. W. L. WESTBROOK suggested that the Institution of Gas Engineers might confer with the Education Authorities round London—in Middlesex, Essex, &c.—and try to arrange for suitable training facilities, or to pay the extra fee demanded by the London County Council from students coming from outside.

Mr. E. L. OUGHTON, referring to the thesis, said that, after the complete manner in which all subjects were treated in Mr. Hole's book, a student would have to be very original indeed if he did not deal with something mentioned there. After studying Mr. Hole's book, one came to quote his figures and his points intuitively. The well-being of the scheme, however, rested with the juniors; and it behoved the Junior Associations to put their backs into it, and make it a huge success.

Mr. HOLE suggested that the London Juniors had an excellent opportunity of giving an admirable lead in this matter. Suppose the London Juniors were to give notice that, after the expiration of five years, they would not admit anyone as a member who did not possess the higher certificate of the Institution of Gas Engineers. He threw this out as a suggestion. Incidentally he mentioned, as a personal matter bearing on the point referred to by Mr. Oughton, that he had often come across examination papers in which almost whole pages had been copied out of his book.

Mr. J. H. GOLDSMITH asked whether, in a case like London, if a student "swatted" on his own, and did not attend an institute, he would be prevented from sitting for the Institution examinations. Also, was it necessary to have practical experience in both gas engineering and supply before being able to sit for the diploma?

Mr. HOLE thought a serious question of principle was raised in the first point. No one could deny the advantages of personal tuition. Correspondence training was the next best, and private reading came after; and he thought the framers of this scheme had done wisely in insisting that a student must satisfy them that he had been prevented from attending an institute. In answer to the second question, it was necessary for a student for the diploma to have practical experience on both sides. It was impossible to legislate generally without hitting somebody somewhere; but in most gas undertakings it was feasible to get practical experience on both sides. Perhaps it was more difficult in London, with its large specialized works—and the same applied to a few of the great provincial undertakings—but otherwise it was possible. Even in the big undertakings he was certain there would be sympathetic treatment for students in this respect, so that they might have the necessary facilities.

Mr. PHILLIPS suggested that a man actually engaged on the district had no time to get practical experience on the works. Why should not there be separate diplomas for the works man and for the supply man, which would involve practical experience on either side respectively? Many of the supply men would like works experience; but they could not get it, because if they had made themselves useful in their own department their chiefs would not part with them.

Mr. ABBOTT said that under the present scheme none of the outside men would ever be able to get the diploma.

Mr. HOLE admitted there was a difficulty here, and said he would, for the moment, have to content himself by answering with another question. Would it not be agreed that a man training for the high administrative posts should have practical experience on both sides?

Mr. ABBOTT suggested that the difficulty could be got over by insisting upon practical knowledge of outside work in the case of the outside man, with theoretical knowledge of works practice; and practical knowledge of works practice in the case of the works man, and theoretical knowledge of outside work.

Mr. HOLE admitted that this was a point which had never cropped up before, and might have to be adjusted.

Mr. W. GROGONO said that a pupil in the Gas Light and Coke Company always had three months on the works. He himself had had twelve months; but this was not with that Company. Regarding the point made by Mr. Hole as to membership of the London Junior Association, during the past year only those who had passed the City and Guilds of London senior examination had been accepted as either associates or members.

The PRESIDENT suggested that Messrs. Abbott and Phillips should discuss the point they had raised concerning the diploma with the members of the Advisory Committee who were present—Messrs. Hole and Chandler.

On the motion of Mr. CHANDLER, seconded by Mr. OUGHTON, a hearty vote of thanks was accorded Mr. Hole.

The PRESIDENT, in bringing the meeting to a close, commented on the splendid attendance, having regard to the fact that the holiday season had not yet ended.

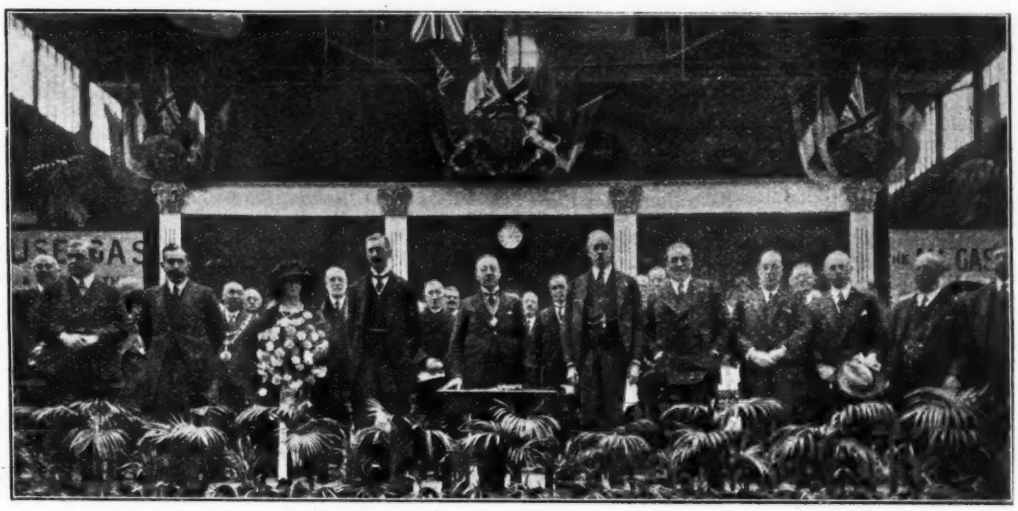
A New Binder for Briquetting.—The "Iron and Coal Trades Review" says the coke resulting from the low-temperature distillation of coal at the Ford plant at Walkerville, Ontario, is to be briquetted with a binder of which large quantities are available in Canada—*i.e.*, waste sulphite liquor from the pulp mills—together with a small percentage of pitch.

NATIONAL GAS EXHIBITION.

BINGLEY HALL, BIRMINGHAM.

Sept. 17 — Oct. 3.

THE universal opinion will be that the National Gas Exhibition (1923), which was opened last Monday at Bingley Hall, Birmingham—and which has been graciously accorded the Royal Patronage of His Majesty the King—is in every way worthy of its predecessors at Earl's Court in 1905 and at the White City, Shepherd's Bush, in 1913.



AT THE OPENING OF THE EXHIBITION.

BINGLEY HALL is the largest hall available for the purpose in the Midlands, and practically every inch of space has been filled with something which will be found of interest to representatives of gas undertakings and the general public. This much will be gathered from the description of the large number of exhibits which will be found in this issue of the "JOURNAL;" while a good idea of the arrangement of the stands is given by the three accompanying photographs—which, however, it should in fairness be stated, had to be taken before the finishing touches had been put to the show. Unlike the last exhibition at the White City, the arrangement of which it will be remembered was on a co-operative basis, on the present occasion there has been what may be termed a combination of the two preceding national displays. There are co-operative displays of model rooms, &c., demonstrating the use of gas and its proper setting in the home; and, in addition, the representative gas-appliance manufacturers have their own stands, on which individual exhibits of

The Rt. Hon. the LORD MAYOR OF BIRMINGHAM (Alderman Sir David Davis), who opened the Exhibition last Monday.

Alderman JOHN HENRY LLOYD, M.A., Chairman of the Birmingham Corporation Gas Committee and President of the British Commercial Gas Association.

their particular goods are made. But while thus allowing individual licence to the various manufacturers to show their commodities in their own way, the Executive Committee have endeavoured to produce a co-operative effect by an appeal to the various exhibitors to adopt somewhat of a standard layout with regard to the construction of the stand facias and the coverings. It will be observed that in the main this effort has been very successful, for the effect of united action is apparent.

THE INCEPTION OF THE EXHIBITION.

The inception of the exhibition may be said to have been due to the fact that the British Commercial Gas Association annual conference was to be held in Birmingham this year. As there had been no national gas exhibition for ten years, and as striking improvements have taken place in this period in the design and efficiency of all types of gas consuming appliances, it was thought to be opportune that an exhibition should be arranged to coincide with the "B.C.G.A." conference, in order to demonstrate to the country at large the present-day importance of the industry, and the many ways in which it is proving of service to home and industry. Unfortunately, the hall could not be taken beyond Oct. 3, which will be the last day of the conference; otherwise the promoters would have prolonged the run of the exhibition so as to cover at least one month

A meeting of the Midland Commercial Gas Association was called early this year, when the proposal was laid before them by Mr. A. W. Smith and Mr. R. J. Rogers, of the Birmingham Corporation Gas Department. It received the unanimous support of the members of the Association; and an Executive Committee were appointed, having as Chairman Alderman J. H. Lloyd, M.A. (President of the British Commercial Gas Association and Chairman of the City of Birmingham Gas Committee), and as Deputy-Chairman Mr. A. W. Smith (General Manager and Secretary of the Birmingham Corporation Gas Department). It was apparent from the commencement that the work in connection with the arrangement of the exhibition would have to take place in Birmingham and district, so that the constitution of the Committees was necessarily largely of a local character. But though this was the case, the fact has never been lost sight of that the exhibition, in order to be of service to the whole industry, must cover as large an area as the funds at disposal would allow.

The following is a list of the Committees and officers of the exhibition:

GENERAL COMMITTEE.

The President and Members of the Midland Commercial Gas Association.

EXECUTIVE COMMITTEE.

The President.—The Right Hon. the Lord Mayor of Birmingham (Alderman Sir David Davis).

Chairman.—Alderman John Henry Lloyd, M.A., President, British Commercial Gas Association; Chairman, City of Birmingham Gas Committee.

Deputy Chairman.—Mr. A. W. Smith, General Manager and Secretary, Birmingham Gas Department.

Mr. F. C. Briggs, Dudley.
Mr. C. H. Carder, Oldbury.
Mr. P. N. Langford, Coventry.
Mr. J. Paterson, Cheltenham.
Mr. R. S. Ramsden, Leamington.
Mr. B. W. Smith, Walsall.
Mr. P. G. Winstanley, Wolverhampton.

Hon Secretary.—Mr. R. J. Rogers, Fittings Superintendent, Birmingham Gas Department.

Hon. Treasurer.—Mr. G. F. Whitehouse, Cashier, Birmingham Gas Department.

Hon. Auditors.—Messrs. Howard Smith, Thompson, & Co., of No. 11, Waterloo Street, Birmingham.

Exhibition Director.—Mr. Charles Stanley, of No. 27, Paradise Street, Birmingham.

SUB-COMMITTEES.

The President, Chairman, Deputy Chairman, Hon. Secretary, and Exhibition Director are *ex-officio* members of all Sub-Committees.

Competitions.

Mr. J. F. Bell, Derby.
Mr. C. M. D. Belton, Shrewsbury.
Mr. C. F. W. Rendle, Redditch.
Mr. T. Thornton, Rowley Regis.
Mr. W. Wilson, Burton-upon-Trent.
Mr. J. C. Walker, Secretary and Assistant Manager, British Commercial Gas Association.

Finance.

Mr. G. F. Whitehouse, Hon. Treasurer.
Mr. P. N. Langford, Coventry.
Mr. R. S. Ramsden, Leamington.

Publicity.

Mrs. M. A. Cloudesley Brereton, M.R.San.I., F.I.H., Editor and Consultant, British Commercial Gas Association.
Mr. F. C. Briggs, Dudley.
Mr. C. H. Carder, Oldbury.

Smoke Abatement.

Mr. A. Mackay, Stoke-on-Trent.
Mr. W. B. Morland, Gloucester.
Mr. H. Pooley, Leicester.
Mr. C. H. Webb, Stourbridge.
Mr. G. Wilkinson, Nottingham.
Mr. W. M. Mason, Manager of the British Commercial Gas Association.

VIEW ON ENTERING THE EXHIBITION.

A PORTION OF THE INDUSTRIAL SECTION.

Technical.

Mr. W. H. Adams, Bilston.
Mr. J. W. Allin, West Bromwich.
Mr. H. Davies, Chesterfield.
Mr. E. Hardiker, Smethwick.
Mr. T. H. Poulson, Stafford.
Mr. F. Shewring, Stratford-upon-Avon.

Subscriptions.

Alderman Lloyd, as Chairman of the Executive Committee, in May last made an appeal to all gas undertakings throughout the country to lend financial assistance to the scheme, in order that the project might be made worthy of the industry. The basis of contribution suggested was one on which the amount to be subscribed declined in proportion to the distance of the particular undertaking from the exhibition centre, as it was realized that the greatest immediate benefit would be felt in the locality in which the exhibition was held. At the same time it was the aim of the Committee to utilize the exhibition as a means of providing publicity to cover the whole industry. It was therefore intimated to gas undertakings which were situated at some distance from Birmingham that the Executive Committee did not ask for a large contribution, but that a small donation, in order to identify that undertaking with the exhibition, would be sufficient. One is confident that, when the full effect of the exhibition and the publicity emanating from it is realized, it will be seen that the comparatively small sum which has been asked for from the subscribing undertakings has been well spent.

The response to the Committee's appeal for funds, especially from the Midland undertakings, was extremely encouraging; while undertakings in all parts of the country have identified themselves with the exhibition. The official list of undertakings supporting the exhibition shows that 138 gas companies and local authorities are financially concerned.

Subscribing undertakings have received, free of charge, advertising matter consisting of stickers, show cards, posters, and handbills; while there was prepared and forwarded to all undertakings an attractive brochure explaining the aims and objects of the exhibition. Then in the case of undertakings subscribing a certain amount, an automatic flash sign was provided free. This sign contained a slide advertising the exhibition, which slide could be afterwards replaced by an opal glass, and thus be made suitable for any further advertising the undertaking might desire.

A detailed account is available in the Hon. Secretary's office, showing the amount of subscription from each undertaking on the one side, and on the other giving a detailed statement of how the subscription has been apportioned to various services for that particular undertaking. An examination of these records will make it clear that every undertaking should be entirely satisfied with the value they have received by reason of the support accorded by them to the exhibition.

A newspaper publicity scheme was drawn up, in conjunction with the officers of the British Commercial Gas Association, by the Executive Committee of the exhibition, and arrangements made to advertise the exhibition in the areas of those undertakings who had subscribed certain amounts. Where the subscription has been a nominal one of a few pounds, the Executive Committee have endeavoured to give some publicity in the local newspapers; and while this may not yet have been apparent in some districts, it is hoped that before the exhibition closes suitable publicity matter will have been arranged in every area.

Work of the Staff.

As was remarked by Mr. Milne Watson, when speaking at the opening ceremony, it is obvious that such an exhibition as this could not have been got together without a great deal of hard work. The writer of this review has had full opportunity of learning how near the scheme is to the hearts of Alderman Lloyd and Mr. A. W. Smith; and during the three days preceding the opening (which, of course, included a Sunday) he saw Mr. Rogers and his staff put in a "round of the clock" on the work at the exhibition—as, indeed, they had done on many days preceding. Mr. Rogers, an indefatigable worker himself (as all will admit who know him), has received the enthusiastic and whole-hearted support of Mr. F. R. Ayre in connection with the publicity and clerical work. The volume of correspondence handled has been enormous, and has necessitated a large staff of typists and others. In spite of the amount of overtime that has had to be put in by all the workers on the clerical side, the whole of the service has been given ungrudgingly, and with the utmost loyalty—each one doing his or her best in order that the preliminary arrangements should be carried through without a hitch. By now all must have felt rewarded by widespread appreciation of their efforts; and this appreciation will grow as the exhibition runs its course.

The Executive Committee were fortunate in obtaining the co-operation of Mr. Charles Stanley, who undertook to assume the financial responsibility of running the exhibition, so leaving any money subscribed by gas undertakings to be used for publicity purposes in the cause of extending the sales of gas. Mr. Stanley has had a unique experience in organizing and directing exhibitions, and is the General Manager of the British Industries Fair, Birmingham, which he has successfully organized during the past four years. The Committee have placed the utmost confidence in Mr. Stanley's ability in directing the exhibition; and the results which he has achieved have been very gratifying. He was faced with the difficulty of having to convert Bingley Hall from a drab-looking building into suitable garb for housing the exhibits of the gas industry; and how well he has done this, will be apparent to all those who visit the exhibition. The decorative scheme, which has been carried out, under Mr. Stanley's direction, by Messrs. W. Legg & Co., of Birmingham, is a pleasing one—especially in connection with the Conference Hall, where the effect is particularly restful and pleasing.

Some idea of the task of running the gas supply services and of the gasfitting work carried out on the stands may be gleaned from the fact that over 11,000 ft.—or slightly over 2 miles—of

pipes have been installed, ranging from 6 in. downwards. The services entering the building are four 3-in., three 4-in., and one 6-in. low pressure; while one 2-in. high-pressure service (12 lbs. per sq. in.) is also laid to the building. The whole of the internal supplies and equipment of the exhibition have taken a little over three weeks, and have called for a staff of forty gasfitters, in addition to a small army of carpenters, plumbers, and other grades of workmen.

The Technical Sub-Committee have been responsible for the equipment of the gas supplies and other work in the exhibition halls—the actual work in this connection having been carried out under the control of Mr. R. J. Rogers (Fittings Superintendent to the Birmingham Corporation Gas Department), and under the supervision of Mr. R. G. Marsh (Fittings Engineer to the Gas Department), Mr. A. Whitehead (Technical Assistant to the Fittings Superintendent), and Mr. F. Westwick (District Inspector). Mr. Whitehead has been responsible for the installation of various services, meters, and fitting work on the stands; and the exhibitors have given repeated testimony to the unfailing courtesy and kindness extended to them by him. It may be added that the experience gained by Mr. Whitehead in the fitting-up of various exhibitions in Birmingham for some years past has admirably fitted him for the responsible work he has had to carry out during the last few weeks. The arrangement of the gas-fittings and gas-appliances on the co-operative stand has been in the experienced hands of Mr. G. M. Lewis (Showroom Manager of the Birmingham Gas Department). The tasteful effect which has been produced on the co-operative stand and on those of the Birmingham Gas Department speaks eloquently of Mr. Lewis's powers in this direction. Omission must not be made from this paragraph of reference to the willing manner in which the gasfitters have worked, in spite of many difficulties, to ensure that nothing should be left undone to meet the wishes of the standholders.

BINGLEY HALL.

Bingley Hall, which is situated within five minutes' walk of the centre of the city, covers a floor space of approximately 500,000 sq. ft., in addition to which there is gallery space running round the main hall which gives a further area of 7000 sq. ft. for exhibition purposes, while leaving sufficient room for persons to promenade. Separate from the main body of the hall on the left-hand side on entering the exhibition is a bay in which the heavy machinery displays—gas-engines, furnaces, and other industrial appliances—are housed.

CONFERENCE HALL.

Following through from the industrial bay will be found the minor hall, in which the conference hall has been constructed, and in which also is a number of stands. The "B.C.G.A." model window display is in this hall. Adjacent to the conference hall, where the luncheons will take place in connection with the "B.C.G.A." conference, are the servery and offices for the Press Agent and press bureau.

The conference hall will hold approximately 400 persons for lectures, and about 325 seated for luncheon; and as it is anticipated that a very large number of engineers will this year be attending the "B.C.G.A." conference, it is likely that additional accommodation will have to be obtained for Oct. 2 and 3. The "B.C.G.A." authorities have this matter well in view.

EXHIBITORS' AND ENGINEERS' CLUB.

With a view to making the exhibitors and their assistants as comfortable as possible, and providing a suitable meeting place where engineers may congregate, the Executive Committee have reserved the annexe on the ground floor as an Exhibitors' and Engineers' Club. The floors have been covered, and comfort will be found in a large number of lounge chairs and settees; while writing tables also are provided. Creature comforts will be attended to here, as a buffet has been arranged for the serving of light refreshments. In a corner of this Club the room set apart for the National Gas Council for the display of the "Standard" cookers is situated.

ENTERING THE EXHIBITION.

The general layout of the main hall produces a pleasing effect. Immediately on entering the hall, the visitor is faced with a tastefully designed garden, with lawn and crazy paved footpaths, in the centre of which is a small fountain, with rockery and rock plants growing. The place of honour at the commencement of the exhibition has quite appropriately been accorded to a bust of Murdoch, which is placed on a pedestal and cannot fail to command the attention of everybody coming into the exhibition. The inscription appended to this bust is in the following terms:

WILLIAM MURDOCH.
1754—1839.
Inventor of Gas Lighting.
To whose genius the gas industry owes its foundation.

Looking at this bust of Murdoch, one is carried back to the difficulties and opposition which were met with, even in those early days of gas lighting.

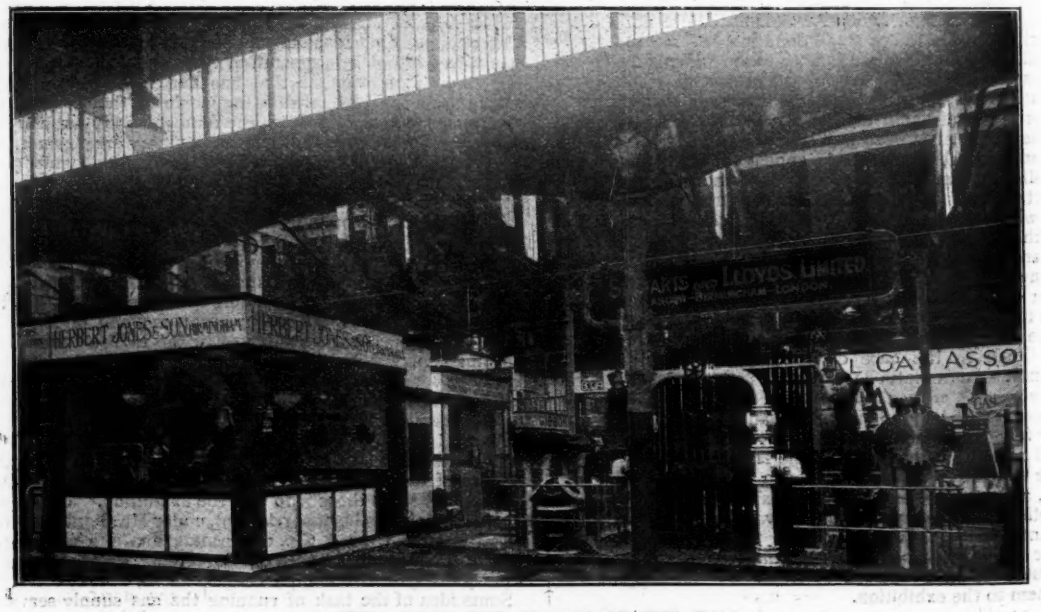
On turning round, the striking development of the industry is made manifest by a display of statistics showing the present magnitude of the British gas industry. Upon the informative board are to be seen the names of the associations whose patronage has been accorded to the exhibition and an alphabetical list of subscribing undertakings. As a matter of fact, the exhibition enjoys the patronage and support of all the associations and societies connected with the gas industry, together with the patronage of important organizations who are in some way allied to the industry. There are, in actual figures, 216 Vice-Presidents, 183 Patrons, and 31 Associations supporting the exhibition.

POSTER STREET.

An attractive display of posters has been arranged by Messrs. Sheffield, Ltd., the well-known billposting contractors. Posters used by gas mantle and appliance manufacturers are shown, together with the artistic series issued by the "B.C.G.A." This display enables one to realize the commercial value of such posters. Poster Street is situated on the side of the industrial section.

COOKERY DEMONSTRATION HALL.

The cookery demonstration hall is in the upper annexe leading from the right-hand side gallery; and here cookery lectures and demonstrations will be given twice daily, the menu being varied to suit all classes of gas consumers. These demonstrations will be given by Miss Edith Sanderson, first-class diplomée N.T.S.C., gold medallist U.C.F.A. All the demonstration cooking will be carried out in ordinary gas-cookers, such as are hired-out by practically all gas undertakings. Those actually in use at the exhibition are supplied on favourable terms by the local gas



A VIEW FROM THE CENTRE OF THE HALL.

undertakings. The cookery demonstration room will hold about 250 persons.

COMPETITIONS.

In order to spread the interest as far as possible throughout the industry, the Competitions Sub-Committee arranged a series of essay competitions open to various grades of employees in the gas industry. A satisfactory number of entries has been received in the different sections; and these are now being adjudicated upon by qualified persons in the industry. It is hoped that the results will be announced before the close of the exhibition.

Cookery competitions of different kinds are being organized; and a large number of school children in the Birmingham district have entered—the preliminary heats being gone through in the cookery centres of the various schools under the local educational authorities. The finalists returned by the schools will qualify for tests which will be held in the conference hall on various dates throughout the run of the exhibition. The judges for the cookery competitions will be Miss Sanderson, Mrs. Rea, and Miss A. G. Pinchbeck (who will adjudicate upon the cookery efforts of the school children). In connection with the children's competitions, a short essay competition has been arranged, with a view to encouraging the children to visit the exhibition and take particular notice of what is to be seen there. The Lady Mayoress of Birmingham will distribute the prizes won during the exhibition, at 3 p.m. on Saturday, Sept. 29.

STRIKING STATEMENTS.

The following ten striking and pithy statistical statements are hung right across the hall, back to back.

A gasholder is the symbol of more sunshine and cleaner air.

3000 trades in this country use gas for various purposes.

Gas is used in over 7,000,000 homes and factories in Great Britain.

Gas will solve the nation's smoke problem.

100,000 persons are employed in the British gas undertakings.

The capital employed in the British gas industry is £150,000,000.

Gas has a record of over 110 years' public service.

10,000,000 gas-fires are preventing the pollution of the air by coal fires.

Gas service means industrial efficiency, domestic economy, sunshine, and health.

Over 4,000,000 gas-cookers are in use in Great Britain.

LIGHTING ARRANGEMENTS.

On approaching the exhibition from Broad Street, by King Alfred's Place or Cambridge Street, there will be noticed an effective scheme of street lighting, which is being carried out by means of eight 10-burner Sugg "Littleton" lamps on new fittings and eight 10-burner Parkinson lamps. Outside the exhibition are two 4000 c.p. Keith-Blackman high-pressure lamps, and one 4500 c.p. "C.B.G.D." converted high-pressure lamp.

The various gangways in the hall are lighted by the following firms: Messrs. W. Sugg & Co. demonstrate the lighting power of their "Littleton," "Swanley," and "Caterham" lamps. Messrs. Parkinson and W. & B. Cowan have lighted one gangway by their six-burner lamps and two gangways by means of their eight-burner lamps. Messrs. A. E. Podmore & Co. illuminate one gangway with their seven-burner lamps; and Messrs. H. Staniforth & Co. also light a gangway with seven-burner lamps. In the central gangways of the main hall are twelve 1500 c.p. and three 1000 c.p. high-pressure Keith-Blackman lamps; while the illumination of the bandstand and auditorium is effected by four 4500 c.p. "C.B.G.D." converted lamps. In the minor hall the Tilley High Pressure Gas Syndicate, Ltd., provide illumination by means of six 1500 c.p. high-pressure lamps, fitted with silica cups, and six similar lamps with mica globes.

The gallery lighting by means of low-pressure gas has been entrusted to Messrs. Evered & Co. and Messrs. Herbert Jones and Son; and effective illumination is provided by the three-light superheater cluster burners supplied by these firms. In the conference hall are six 12-burner "Westgate" and three 6-burner "Bon Marché" lamps supplied by Messrs. Sugg & Co., each type of lamp being fitted with that firm's distance control service for the instantaneous lighting and extinguishing which is necessary when the hall is used for lantern lectures. In the Exhibitors' Club tasteful lighting effects are afforded by burners, fittings, and shades supplied by Messrs. Evered & Co.; while the lighting in the dining room over the main entrance to the hall is furnished by elegant gas-fittings manufactured by Messrs. William Whitehouse & Co., fitted with "Orto" burners supplied by Messrs. H. Jones and Son. The gas-fittings in the refreshment bars are by Messrs. Evered & Co.

VENTILATION.

The ventilation of Bingley Hall is accomplished by means of sixteen 36-in. Keith-Blackman "Streamline" fans, which have been fitted in the roof, and the current for which is supplied by a 30 KW. "National" gas engine generating set. The engine and generator are situated on the stand of that company in the industrial section.

MODEL GAS-WORKS.

An exhibit which will doubtless prove of special interest to gas consumers in Birmingham is a large model of the proposed new gas-works to be erected at Washwood Heath for the City of Birmingham Gas Department. The model has been very cleverly executed, and shows the complete layout of the new works, with manufacturing and storage plant, coal equipment, and railway sidings. Each of the two holders at these works will ultimately provide storage capacity for 10 million c.ft. of gas. A start has already been made with the excavations for the holders; and photographs are exhibited which indicate the progress to date.

OPENING CEREMONY.

The exhibition was opened on Monday afternoon by the Lord Mayor of Birmingham (Alderman Sir David Davis), the President of the exhibition, in the presence of a large number of Patrons and Vice-Presidents, and many others. The Lord Mayor and Lady Mayoress were met at the entrance to the exhibition by Alderman Lloyd, Mr. A. W. Smith, Mr. Rogers, and Mr. Stanley. Here the Lady Mayoress was presented, on behalf of the Exhibition Director, with a handsome bouquet, by Miss Honor Joan Lloyd, the little granddaughter of the Chairman of the Executive Committee. So many well-known men, both in the gas profession and outside it, were present that it is impossible to name them here. On the right of the Lord Mayor sat the Right Hon. Neville Chamberlain, M.P. (Chancellor of the Exchequer); while the front row on the platform also included Mr. D. Milne Watson (next to the Lady Mayoress), Alderman Lloyd (on the left of the Lord Mayor), Sir Arthur Duckham, Mr. F. C. Tilley, and Mr. T. Hardie. Mr. F. W. Goodenough was on the platform. In all 34 Patrons, 59 Vice-Presidents, and 25 representatives of gas undertakings had intimated their intention of visiting the exhibition that day. Among letters of apology for absence was one from Dr. Charles Carpenter. Sympathy was expressed with Alderman Sir William Kay, of Manchester, who was unable to be present, on account of the death of his son through an accident.

Immediately the Lord Mayor had declared the exhibition open, the band (concealed in the historical section, behind the bandstand proper, on which the opening ceremony was taking place) played the National Anthem, the whole scene being one of great animation.

REMARKS BY THE LORD MAYOR.

The LORD MAYOR: It is ten years since the last previous National Gas Exhibition was held, and in that period great advancement has taken place, not only in the methods of gas manufacture, but in the design and development of appliances for its use, both in the home and in industry. It is the aim of the promoters of the exhibition to bring before the notice of the public the many uses to which town gas is now put in our national life. There have only been two previous National Gas Exhibitions, each of which was in London; so that this is the first exhibition of the kind to be held in the Provinces. As Lord Mayor of the city, I hope it will be your verdict to-day that the venue has not been ill-chosen, and that the exhibition will prove at least equal to—if it does not surpass—the two which have preceded it.

We take great pride in Birmingham in the fact that the inventor of gas lighting—William Murdoch—lived and worked here in connection with that famous Soho factory controlled by Messrs. Boulton & Watt. You will find in the historical exhibits in the gallery a splendid collection of Murdoch relics which have been loaned for this occasion by the Birmingham Libraries Committee. From this point of view alone, I think you will agree that it is very appropriate that this city should have been chosen for the first National Gas Exhibition outside London. The civic authorities in this City have always taken a very keen interest in the developments of the gas industry; and we are proud in the knowledge that the Birmingham Gas Department is the largest provincial gas undertaking in the country. It has always been a progressive undertaking, and to a large extent we owe this to the vision and wisdom of the man who was primarily responsible for the Corporation's purchasing the undertaking in 1875-6—the late Mr. Joseph Chamberlain. He, as first Chairman of the Gas Committee, laid down lines of administration and policy which have been the foundation of its development.

I have been supplied with a great many statistics indicating the almost romantic growth and development of the gas industry of this country. I will not weary you with these; but those of us who are not actually connected with the gas industry have only to look round and study the bannerettes which are displayed in the hall, and the statistical diagrams which have been placed in the gallery, to realize the big part that this industry plays in the prosperity and welfare of the nation. The public, who we hope will attend this exhibition from all parts of the country, will thus have a better idea than ever before of what they owe, not only to the pioneers, such as Murdoch and those who followed him, but to the modern gas engineer and gas apparatus manufacturer, chemist, and tar distiller. We have here collected under one roof many varied appliances in which gas is used, which make for greater comfort in the home, reduced work in housekeeping, increased efficiency and economy in industry; and, above all, from a purely civic point of view, we shall be able to realize the splendid manner in which gas engineers and apparatus manufacturers in this country are attempting to solve the problem of the smoke evil, which is the curse of most industrial centres. One has only to consider this city alone to obtain an idea of the help that gas is in this respect. There are in the Birmingham area approximately 180,000 gas-cookers and 80,000 gas-fires installed; and I am told that in cold weather the gas-fire load in Birmingham is anything from 25 to 30 million c.ft. per week. Extend this over the whole country in the millions of homes in which gas is used to-day, and the 3000 odd trades in which gas is relied upon as a fuel, and one begins to appreciate the tremendous reduction in smoke which this represents.

The gasholder is generally looked upon as an eyesore on the landscape; but I think the organizers of this exhibition, in the bannerette which is hung from the roof, rightly claim that, instead of this it

should be considered a symbol of more sunshine and purer air. Speaking as a gas consumer, as well as in my civic capacity, I look forward to the time when the price of gas will be reduced to such a level that the adoption of the modern apparatus which we see here to-day will be universal in this country—resulting, as it will, in more sunshine, purer air, and better health to those who have to live and work in our cities and towns. I am delighted to see so many representative gas people here to-day, and offer to them on behalf of the city a very hearty welcome. I am very proud to act as President of such an important, and I hope epoch-making, exhibition. I have now much pleasure in declaring the exhibition open. [Applause.]

THE CHANCELLOR OF THE EXCHEQUER.

The Right Hon. NEVILLE CHAMBERLAIN: I am very glad, in the brief interval which lies before me, until I have to turn my attention to the interesting, but I assure you most uncongenial, task of picking your pockets, to be able to be here this afternoon and to see something of this exhibition in connection with one of our greatest national industries in what I think I may further call its natural home. The Lord Mayor has reminded you that not only was it in Birmingham that Murdoch worked out and demonstrated the value of his great invention of lighting by coal gas, but that the Birmingham Corporation are to-day the owners of the greatest gas undertaking in the whole of the Provinces. As a Birmingham citizen, as a past member of the Gas Committee, and as the son of its first Chairman, I am very proud of that undertaking. It is not merely because it is so big. Bigness is, I believe, a great virtue in gooseberries and prize pigs; but I do not think otherwise it is itself a title to greatness. I am proud of our undertaking because, with some little experience of business, I believe it to be a thoroughly well managed, efficient, and progressive organization. Those who have been responsible for its conduct have brought to it the very highest qualifications in commercial ability and in technical and engineering skill. The use of gas has long passed beyond that to which it was originally put—namely, lighting. I believe that to-day in Birmingham something like one-third of our gas production is devoted to the purposes of motive power and of manufacturing—to the very great benefit of our industries—and this development is largely due to the enterprise of the staff in finding out and in demonstrating its value for heat treatment.

Then there is that other development to which the Lord Mayor has made allusion—the spread of gas-cookers and gas-fires. Last session there was introduced into the House of Lords, by a representative of the Department for which I was then responsible, a new Smoke Abatement Bill. I have seen criticisms of that Bill on the ground that it does not offer a prospect of sufficiently worrying industry. But are we quite sure that we want to add more worries to those under which industry is labouring to-day? If that be a desirable object, I think I can find opportunity in my present office to lend a helping hand to the good work; but I have an idea that a time when industry is down and is fighting for its life is not a happy moment to impose upon it new and costly expenditure. If, however, it be the fact that there are in the area of our local gas supply something like 180,000 gas-cookers in work, then we may reflect with satisfaction that this means that a similar number of fires are no longer pouring out smoke into the atmosphere, which are no longer contributing to that huge mass of carbon which every year descends upon us in our great industrial centres. In my capacity as Minister of Health, I had occasion to mark how the greatest and most fatal diseases of all those from which we suffer are the diseases which affect the respiratory organs; and these are the organs which are affected chiefly by the smoke of our great cities. Therefore I say that the gas industry, by the development which it has been able to effect in this direction, is conferring a double service upon us, as it is not only benefiting the individual consumer by adding to his convenience, but it is also relieving the lungs of the general public.

I remember that when I was Lord Mayor of this city, I received a deputation one day from some inhabitants who dwelt in that paradise which surrounds the Winson Green Gas-Works. They came to me to know what I thought would be likely to happen to them if a Zeppelin were to fly over the city and drop a bomb into one of the gasholders. I am not an expert on these matters. I was not sure what would happen; but I thought it was fairly safe to tell them that they were not likely to suffer a more than temporary inconvenience. Well, after they had gone away much comforted, I took the precaution to inquire of those who did know; and I confess I was a good deal relieved to hear that all that would happen in such circumstances would be a bonfire on a considerable scale. In conclusion, I do wish the greatest possible success to the gas industry in general, and to this exhibition in particular, and trust that it may be the means of making known more widely the capabilities and the potentialities of gas, thereby adding something to the prosperity of the country.

THE BAD AND THE GOOD.

Mr. D. MILNE WATSON: It is a great pleasure indeed to come here this afternoon and to move a very hearty vote of thanks to the Lord Mayor for so kindly opening the exhibition; and if I may extend the terms of my motion, I should like to include the name of Mr. Neville Chamberlain. As the Lord Mayor has already told you, we have had two National Gas Exhibitions; but I do not think either of them was graced by the presence of the Chancellor of the Exchequer. It seems to me there could be no more proper place for a gas exhibition than Birmingham, where, as you have heard, the earliest associations of gas are linked with the name of Murdoch, and where that distinguished man, the late Joseph Chamberlain, secured the gas-works for the Corporation. Now this exhibition, I am sure we all know, could not have been got together without a great deal of work; and we all owe a very deep debt of gratitude to the Gas Committee for what they have done—and particularly to Alderman Lloyd, Mr. Smith, and Mr. Rogers. Having had something to do with the organization of the last two gas exhibitions in London, I know the great amount of labour involved. With the result I am sure you will be satisfied. Here are collected a series of exhibits which will open the eyes of a great many people who possess a very limited idea of what gas can do.

It is ten years since the last exhibition took place in London; and what years they have been! The gas industry has passed through seas of trouble, like the country itself; and while doing its best to supply man-power to fight in the war, it also did a great deal to supply munitions, which were so much needed. The industry went through a very bad time indeed, because we could not deliver gas of the same quality as we had done before the war; and we were constantly being blamed for that. We have now got over a good many of our troubles. Even the therm difficulty seems to be settled at last. This period of ten years has, on the other hand, not been unproductive, for much good has come to the industry. We have been put into a new position in consequence of the passing of the Gas Regulation Act; and I think, when it is more fully understood, the therm will be discovered to be a great blessing to the public generally. The gas industry has been brought closer together, and we have been enabled to found the National Gas Council for the protection of the industry. A better understanding has also been brought about between the men working in the industry and the employers; and there has come into existence one of the best Joint Industrial Councils to be found.

I would like to remind you that we are here to-day speaking about an industry which is one of the very oldest in the country. It is 120 years old, and really was the pioneer of modern civilization—this fact is too often forgotten. Gas lighting was one of the first things that brought about civilization as we understand it to-day. The history of the industry has been one of continued progress. As Mr. Chamberlain has just remarked, first it was lighting only, by means of the old flat-flame burner; and afterwards came the incandescent mantle, which entirely altered all ideas of lighting. Now we use gas for cooking, heating, power, and the thousand-and-one purposes that the British Commercial Gas Association tell us all about. One of the great faults of the gas industry is that it has been far too modest. We do not intend to be so any longer. We mean to have more of these exhibitions, which are of use to the public and to the industry itself. There is plenty of work left for the industry to do—plenty of work for us in the future. If we introduced civilization—and I am not, perhaps, putting the matter too high—120 years ago, we intend to do much more in the future. We have still a great mission before us. We have got the mission of conserving our coal resources, of producing most valuable bye-products, and of beautifying and cleansing our towns by purifying the air. I think you will agree with me that, with all that before us, there will be plenty for us to do in the future.

GOOD SERVICE.

Sir ARTHUR DUCKHAM: I have much pleasure in seconding this resolution on behalf of those interested in the trade of gas apparatus manufacturing. I think that anybody coming here to-day and seeing this exhibition must feel very proud of being connected with the gas industry. When we see the great advances that have been made, I think we must be satisfied that we have gone on well, and must be spurred to still greater efforts. We must also feel that we owe a deep debt of gratitude to the Lord Mayor and the Birmingham Gas Department, in connection with this exhibition. We know that the Corporation of Birmingham are renowned throughout the country for their splendid work for the advancement of the gas industry. I would like to draw your attention to the fact that the whole of the prosperity of the gas industry rests upon service to the public. Unless the industry can give good and satisfactory service to the consumers, it will not be a paying industry either for the gas undertaking or for the trader who makes the requisite apparatus. I would have the public remember that all the time there are thousands of brains in the gas industry devising new apparatus which will make home life more comfortable and industrial life more prosperous.

Finally, the Chancellor of the Exchequer has referred to the smoke nuisance. The great hope for the clean city and healthy town lies in the gas industry; for that is the industry to supply smokeless solid or gaseous fuel. You have the gas industry coming forward with cookers and fires which have helped so much to reduce smoke.

The resolution was carried with enthusiasm; and a tour of the exhibition was then begun.

PRESS VIEW.

A Press view on Friday morning was followed by luncheon, which was presided over by the Chairman of the Executive Committee—Alderman J. H. Lloyd, M.A., J.P., who remarked that he did not think "magnificent" was too strong a word to use in regard to the exhibition and all that it implied. The exhibition, he said, had been organized on interesting and instructive lines; and its purpose was to bring home to the people of this country generally, and to householders in particular, the manifold uses to which gas could be put. They would show how useful gas could be, and how economical—this point must not be forgotten—for lighting and heating, as well as for cooking and for a great variety of industrial purposes. All these things would be demonstrated at the exhibition; and it was hoped that one result would be to impress upon the people the importance of using gas in place of raw coal—thereby improving the nation's health, and avoiding that enormous amount of waste which was inevitable in the present-day use of raw coal. In many ways it was hoped to convince all sorts and conditions of men and women of the beneficial uses of gas in the home and in industry. To the manufacturer who was always on the alert for ideas for improving and cheapening his manufacturing methods, the exhibition should be of peculiar value. Especially so would it be to those people who had to do with heat-treatment problems.

The toast of "The Press" was submitted by Mrs. M. A. Cloudesley Brereton.

A VIEW OF THE EXHIBITS
AT BINGLEY HALL, BIRMINGHAM.

IN the succeeding columns we have endeavoured to supply a comprehensive account of the exhibits at Bingley Hall, giving prominence to features of special interest. The numerical order of the stands has been preserved, and the ground plan and gallery plan are included, so that readers hitherto unable to make the journey may determine their "bearings" before their visit. No effort has been spared to make this review worthy of the occasion; and we trust that sins of commission and omission may be few. Some of the stands are very briefly noticed—due to the unavailability of full information at the time of the collection of the material.

No. 1.—THE RAWLPLUG COMPANY, LTD.

This firm make the statement that the gasfitter will be able to save three-quarters of his fixing charges by the use of "Rawlplugs," which are used in large quantities by the principal gas companies throughout the country. The applications of this handy and remarkably effective contrivance are far too numerous to outline here, for they range from the fixing of gutters to the hanging of pictures. Surfaces such as those of marble, slate, plaster, tiles, or concrete present no difficulties; and the finished job possesses a factor of safety unknown to the old methods of plugging. Demonstrations are given at the stand in the use of "Rawlplugs" and also of "Recess" screws—the latter so called because of their recessed heads which grip the driver, eliminate the troublesome slipping which is part and parcel of the old method of screw-driving, and obviate hasty words. Once the screwdriver is placed in the recess, it stops there as long as required. The screw being thus fixed to the driver, forms a gimlet and can be driven home with the greatest ease into any wood, even hard oak, without the use of a gimlet. The recess in the centre of the screw is symmetrical, and gives the screw a much more attractive appearance than that of the ordinary slot type. There is nothing which so conduces to the artistic finish of the modern room as the quality of the various fittings; and the highly-polished aluminium fittings exhibited by this firm are not only pleasing in appearance, but will harmonize with any scheme of decoration. Moreover, they are inexpensive.

No. 2.—PNEUMATIC GAS LIGHTING COMPANY, LTD., AND G. H. BANNING.

Mr. Banning is the sole agent in the Midland Counties for the Pneumatic Gas Lighting Company, Ltd., manufacturers and patentees of the well-known switch for operating gas-burners from a distance, and of Neville's lift-off burners. The advantages from a maintenance point of view, of this burner for domestic, shop, and factory lighting, are emphasized.

Along with the Pneumatic Company's specialities, a selection of gas-fittings of various kinds and accessories is shown by Mr. Banning.

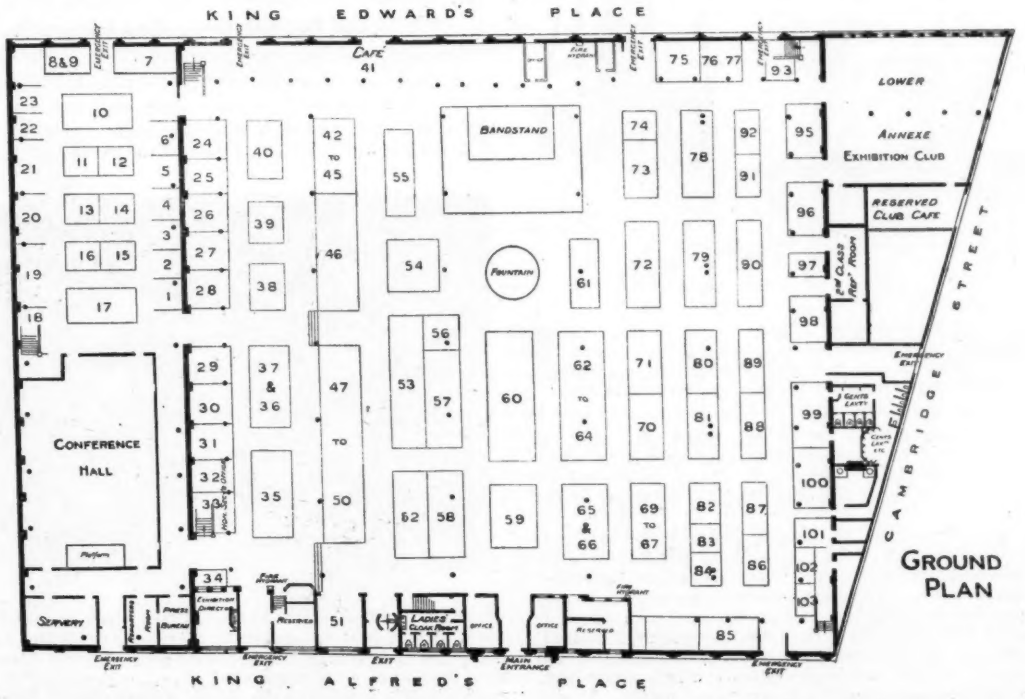
No. 3.—MESSRS. H. STANIFORTH & CO.

The front of this stand is lighted with the firm's well-known "Broadway" lamps. Those lighting the facia board are fitted with semi-parabolic reflectors, and there are also 7-lights carrying advertising screens. Nine 7-light "Broadway" lamps are to be noticed lighting one of the gangways in the main hall.

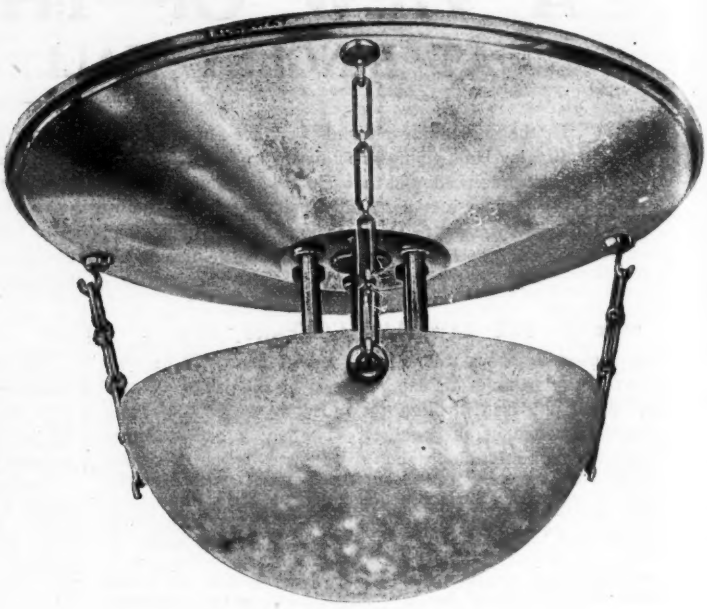
The special feature of the "Broadway" lamp, apart from its sturdy build and efficiency, lies in the accessibility of the burner parts. This feature is, we understand, much appreciated by the many users of the lamp—particularly in bad weather, when it is possible to clean the burner without opening the globe. The foundation upon which the lamp is built is a cast-iron central flue, which ensures rigidity, and at the same time reduces the vulnerability of this vital part to corrosion. Lamps are shown with casings of copper and of enamelled steel. A new form of air regulator is being fitted this season, which makes this item more accessible than hitherto. We may interpose here to say that a special feature of the lamps shown, and indeed all the lighting fittings on this stand, is the absence of gauze in the nozzles. In its stead a patented magnesia disc is used; and it is claimed that this is much more efficient than the perforated nozzle, as the flame fits the mantle better and there is less cooling surface in contact with the flame.

A 10-light "Kenton" fitting in aluminium gives, with its specially designed reflector, 1600 c.p. with a consumption of 20 c.ft. per hour. This fitting, which we illustrate, has a novel preheater with central ventilation, which is a special feature of this firm's large units. The "Kenton" fitting is particularly suited for the lighting of large rooms. A 4-light "Carlton" semi-indirect, in Florentine bronze, looks very attractive with a "Luna" bowl, as does also a 6 light "Gayton" semi-indirect fitting, with a "false ceiling" for positions where a good white ceiling is not available. These fittings, which are making their bow for the first time at the Exhibition, should attract the attention of those who are looking for something new in gas lighting.

Another of the firm's lamps that is making its début is the "Rodney," which is made at present to take three or four No. 2 mantles, but will later on be carried out in larger sizes. Its air intake and products discharge are patented features; the object being to take in air unvitiated by the products. The well-



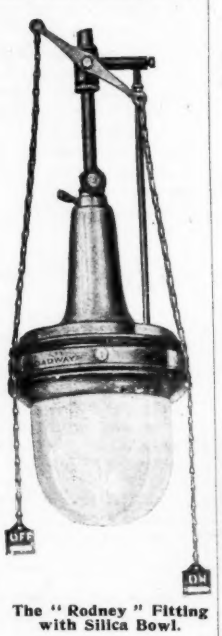
The "Broadway" Lamp.



The "Gayton" Semi-Indirect Fitting.

known "Castleford" in enamelled steel and aluminium is noticed, and also the smart "Kingsbury," with vitreosil globe. Three new patterns of domestic burners are shown: The "Meteor," the "Luna," and the "Solium;" the "Luna" being constructed on the same principle as the "Rodney" fitting above-mentioned. We understand that 21 c.p. per c.ft. is the normal efficiency of this "Luna" burner; while the "Meteor" and "Solium" give 19·5 c.p. per c.ft. It must be agreed that 21 c.p. per c.ft. is a very high efficiency for a domestic burner. Though the burners shown are in aluminium, they are marketed in all the usual finishes. For street lighting, simple and inexpensive designs of

The "Carlton" Semi-Indirect Fitting.



The "Rodney" Fitting with Silica Bowl.

swan-neck and harp fittings are shown, fitted with No. 705 "Broadway" lamps. In addition to a range of "Broadway" conversions, a 16 in. square lantern is shown converted by means of a particularly neat complete conversion known as the "Brentford."

Owing to lack of space on the stand (a matter which was outside the control of the firm) it has been found possible to show only one representative form of the "New Departure" geyser—a 3-gallon sealed type. This geyser, which is constructed entirely without solder, has for its special feature the ease with which it can be repaired without return to the makers' works or, if desired, without being removed from position. This is rendered possible by a fine example of the metal-spinner's art, which, apart from the question of geyser construction, is worthy of notice. It will be observed that it is almost impossible to damage this geyser by overheating. We are informed that Messrs. Staniforth have had an open-type geyser in aluminium running for some time and that it is giving entire satisfaction.

No. 4.—THE WALLWIN COMPANY.

Here is to be witnessed a complete demonstration of the Wallwin system of air and gas apparatus for industrial purposes.

No. 5.—THOMAS WINSTON.

The new "Peter Pan" light, the feature of this stand, is a small burner, sufficient to meet requirements in lavatories, passages, &c., with a trifling consumption of gas.

No. 6.—PLENO, LTD.

"Pleno" patent gas plants and other apparatus are arranged at this stand.

No. 7.—BRITISH URALITE AND CELLACTITE WORKS (The Non-Corrosible Pipe Company).

Here are exhibited many products which, to the gas industry particularly, are of very great interest, and inspection of which, coupled with a perusal of explanatory literature, will reveal the fact that a special effort is made to render service by the supply of materials which are proof against the ravages of corrosion so

prevalent and destructive in many cases where iron and steel are used. Attention is first drawn to "Urastone" (Uralite-Asbestone) flue pipes and fittings, the application of which is demonstrated by a display of gas-heated appliances. "Urastone" is non-corrosible, and is durable to the extent of permanency, ensuring both

economy to the buyer and substantial reduction in maintenance costs to gas undertakings which put out apparatus on hire. In addition, the material is non-conducting, so that condensation is reduced to a minimum, and steady up-draught created, with the result that the products of combustion are efficiently dispersed and indoor atmosphere is in no way depreciated by convected heat. The Company make a special feature of their combined down-draught preventers and flue exhausters, including the well-known "Roventa" cowl now made in "Urastone." Members of the gas industry are specially invited to observe from the display that all kinds of "specials" can be obtained in this material, as well as standard fittings in common use.

Another material, "Asbestone," also non-corrosible, non-conducting, and fire-resisting, is displayed in the form of slabs for placing underneath cookers, and sheets for surrounds to fires; the latter being available with a plain surface, or with a brick or tile pattern impressed. "Asbestone" is inexpensive, easy to fit, and can be coloured to tone with existing schemes of decoration. It is also supplied in flat and corrugated sheets, as shown, for gas-works buildings, for which its properties render it eminently suitable. Finally, there is on view "Uralite," which has over twenty years' reputation as a fireproof material, and has remarkable powers of resistance to acid fumes.

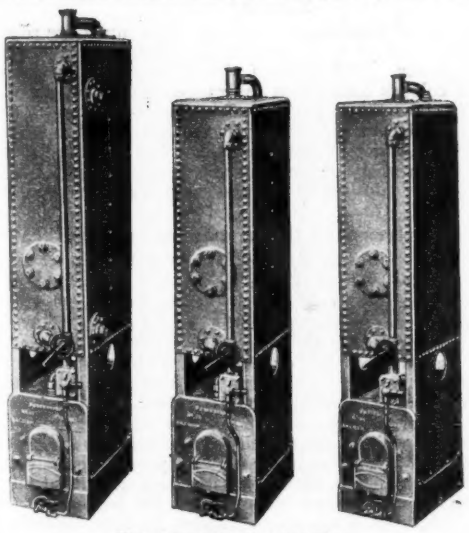
No gas engineer should leave this stand without making an inspection of "Cellactite" pipes, which in the near future will be manufactured on a very extensive scale. Pipes of this material are unaffected by internal or external corrosion, electrolytic influences, or light oils in vapour such as benzole. They are of exceptional tensile strength, and their weight as compared with that of iron is a great feature in favour of "Cellactite;" pipes in this material being about a quarter the weight of the average iron gas-mains. To gas engineers the physical and chemical properties of "Cellactite" will create great interest, and will perhaps simplify distribution problems now prevailing.

MESSRS. THOMAS POTTERTON.

The exhibit of this firm is on the stand of the British Uralite and Cellactite Works, and consists of the standardized types of "H" series "Victor" boilers and complete apparatus; one of each style being shown—viz., No. 92 "Victor" boiler, and No. 921 complete apparatus. In conjunction with these an example is given of the correct arrangement of flue connections to a brick chimney for the disposal of the products in which the anti-down-blow equipment is included. The fluepipe used is the product of the British Uralite and Cellactite Works, which from experience has been found to be a great improvement upon the ordinary sheet-metal goods, and is now generally adopted by hot-water engineers and the principal gas companies.

No. 92 "Victor" Boiler.

The "Victor" boiler "H" series is made in two sizes—viz., No. 92 for 60 c.ft. gas consumption, and No. 93 for 80 c.ft. consumption. The "Victor" apparatus shown is of the rectangular type, No. 921 size, having a 20-gallon rectangular storage suitable for ordinary residence work where one bath exists. The apparatus is complete with Potterton's cut-out valve for reducing the quantity of water in circulation when baths are not required; and it likewise has the standard type of thermostat with capsule regulation. Where preferred, the metallic-rod thermostat can be applied.


The "Complete" Apparatus.

For the Midland Counties and North of England, where the main water service is of a soft, and therefore corrosive, nature, "Victor" boilers are regularly prepared in a special form to prevent rust; and in these cases the complete apparatus is made up with copper storage cylinders and brass pipes, also gun-metal connections for the circulation, thus rendering the system suitable for all domestic supply work. The complete apparatus can be made in various capacities to meet the requirements of large houses.

Nos. 8 & 9.—ETNA LIGHTING AND HEATING CO., LTD.

A number of "Etna" specialities are displayed—including patent inverted burners of every description, gas rings, laundry irons, soldering irons, automatic and other forms of muffle furnace, blacksmith hand-forged ornamental ironwork, &c. There are also "Etna" mantles of different sizes. The "Etna" system of heating consists of a small burner alight inside a copper flue pipe—this copper flue pipe being extended round the room, and therefore distributing the heat over a wide area. It is particularly suitable for workshops and factories, as well as for warehouses where a regular temperature requires to be maintained.

No. 10.—MESSRS. FALK, STADELMANN & CO., LTD.

The evolution of the machinery employed in the manufacture of the Veritas mantle precludes the possibility of exhibiting any process in the space at the disposal of the firm. They are, however, showing the mantle in all stages of its manufacture, from the raw material to the finished product. Lighting glassware has always been a speciality of this firm; and they are showing a selection covering glass used for strictly utility purposes, as well as the more ornate type for luxurious house lighting. There are, of course, all types of fittings exhibited, including many new and pleasing designs in silk and bead shades, as well as lamps for interior and exterior lighting. The popularity of the semi-direct system is catered for; and some beautiful bowl fittings are to be seen.

Some novel and efficient patterns of the well-known Veritas burner are shown. Among these, the Veritas "Quick-Grip" burner and the "Super-Veritas" burner are specially worthy of note. The former is an entirely new departure in the design of the single burner as opposed to the multiple unit, by means of which very pleasing semi-direct lighting effects are obtained. Apart from the advantage of an evenly-distributed light and absolute protection from strong rays, the simplified method of fixing the glassware obviates accidental damage to mantles. The burner is also made to take three bijou-size mantles in place of the single

Veritas "Quick-Grip" Burner.

universal. The "Super-Veritas" burner which the firm introduced last year is of bold design executed in heavy-gauge polished aluminium, and, being fitted with a cluster fitment, develops 300 c.p. This is also shown with a patent regulator by-pass, with lever and chains, and with a 10-in. highly-polished aluminium reflector.

The firm are showing a range of gas cookers, heaters, fires, and domestic appliances. Special note should be made of the "Mentor" cooker—a cleanly-built and attractive piece of apparatus, in which special attention to economy and efficiency in use has been made. The "Wizard" gas heater has been designed to meet the demand for a portable heater which is at once effective and odourless. The models shown demonstrate the possibilities of the line.

No. 11.—SOUTH STAFFORDSHIRE MOND GAS COMPANY.

Among the exhibits of this Company may be mentioned their "Anosol" disinfectants, in liquid and powder form. These disinfectants are free from carbolic and cresylic acids and their

homologues, and are non-poisonous, non-caustic, and non-corrosive, while their germicidal power is far greater than carbolic and its compounds. "Zulite" wood preservative, stain, and insecticide, which is prepared in 19 different shades, unlike many preservatives, does not require heating before application. It has proved invaluable for preserving timber of all kinds against rot and insect attack in this country and in the tropics. It is also used for curing damp walls, &c. The panels of this Company's stand are treated throughout with "Zulite." Notice must also be given to their "Melanoid" bituminous paints. These are of pure bitumen and are capable of resisting corrosion either atmospheric or acidic. The paints are prepared in brown and red shades which contain as much bitumen as the ordinary black variety. Consequently, they possess the best features of both bitumen and oxide paints. Other preparations of the Company which are exhibited are: Bright producer pitch, tar oils, ammonium sulphate (neutral and ordinary), "Larvite" (a winter wash for fruit trees, &c), and "Weedex" (a non-poisonous weed-killer).

No. 12.—CITY OF BIRMINGHAM GAS DEPARTMENT.

[The following account also covers Exhibits Nos. 60, 105-6, 108-12, 133-4.]

The City of Birmingham Gas Department have accepted the opportunity of showing the many advantages which they can offer to the builder, the furnisher, the housewife, and the public generally. This applies more especially to the latest designs in cooking and heating apparatus, gas lighting, and the supply of hot water for baths and lavatories.

With regard to cooking stoves, it is interesting to note the progress, from the cleanliness and convenience points of view, which has been made during the last few years as well as on the lines of economical working. Particular attention is called to the "New World" cooker, manufactured by Radiation Limited, with its high-efficiency hotplate and specially-constructed oven. The claims made for the oven are that, by special arrangement of the burner and flue outlet, the heat is more uniform and consequently the useful space larger than in cookers of the ordinary type; and by the elimination of the usual grid supports, cleaning is facilitated. It is fitted with the "Regulo" heat adjustment, whereby any degree of heat can be maintained for long periods without fluctuation, thus relieving the cook from any anxiety as to whether the contents of the oven are being overdone by a sudden rise in gas consumption through extra pressure. The "Cabinet" cooker by the Parkinson Stove Company, Ltd., opens a new field for the enterprising sales manager to lay before the public. In this case, the boiling plate and oven are both raised to a convenient height for practical purposes. The burners are highly efficient, and the whole is constructed to allow of maximum efficiency and utility. Other popular designs in cooking apparatus are the "Bungalow," by the Richmond Gas Stove and Meter Company, Ltd., and the "Alpine," by the Davis Gas Stove Company, Ltd.; both being much admired by reason of their high efficiency and clean and workmanlike appearance. In the "Maintenance" cooker, by Messrs. R. & A. Main, Ltd., and the "Challenge," by the Cannon Iron Foundries, Ltd., will also be found the same endeavour to produce high domestic efficiency with many well-constructed, original, and interesting points. These are, in fact, popular priced replicas of the highest-grade modern cookers.

GAS-FIRES.

The gas-fires exhibited show decided improvement in design and efficiency, the various metal finishes and styles of ornamentation combining to meet the requirements of any furnishing scheme. A number are displayed, fixed with tiled mantel surrounds, thus showing to the public the finished appearance of such installations. Attention is called to the "Cactus" by the Cannon Iron Foundries, of Bilston, with the sloping fire front, which will appeal to many because of its bright appearance and high efficiency. The "Swastika" fire, in special non rusting oxidized-silver finish, and fitted with the patent injector-ventilator, by Messrs. John Wright & Co., should also be noted. Another fire which is of interest is the "Conrad" fire, in armour-bright finish, manufactured by the Parkinson Stove Company, Ltd., who claim to obtain a higher heating efficiency by utilizing a certain amount of convected in addition to radiant heat. This stove is fitted with a side kettle boiler, incorporated in the design of the fender, which is certainly more artistic than usually obtains. Another handsome fire is the "Gnome," by Messrs. Arden Hill & Co., which is also fitted with the injector-ventilator. The graceful lines of this fire will appeal to many. Other fires by the principal makers are also shown, thus offering a large selection to the public.

GENERAL FITTINGS.

The fittings display is a wide and varied one, specially selected to meet the demand for neatness and reliability; no superfluous ornament being allowed, to harbour dirt and corrosion. Shade lights and candela fittings, by Messrs. Evered & Co., Messrs. E. H. Jones & Son, and Messrs. William Whitehouse & Co., Ltd., are prominent examples of high-class work. Some new ideas in bowl lights with "Supastone" glass are also displayed, and a selection of Sugg's interior fittings with vitreosil globes are of interest. Ten 1500 c.p. high-pressure lamps, each with cup-and-ball joint, plain lever cock, and by-pass tubes with protectors, manufactured by Messrs. James Keith and Blackman Co., Ltd., are exhibited.

WATER HEATING.

To show the capabilities of water heating by gas, a Parkinson "Treasure" geyser, and Wright's "B.T.U." are attached to bath and lavatory basin, to demonstrate to any inquirer the efficiency of the apparatus at a moment's notice. Gas-heated laundry irons are also connected for demonstration purposes. The remarkable popularity of this apparatus in Birmingham is easily understood when one remembers that with a consumption of 5 c.ft. for one hour, and a cost of one penny for five hours, the domestic ironing can be accomplished with economy, ease, and dispatch.

There is also arranged a series of exhibits of educational value. Dry and wet meters with glass cases are shown actually working; and sections of gas-fires and other apparatus, a range of burners of different sizes showing comparative illuminating power and consumption, a practical demonstration of the heat-resisting properties of vitreosil ware, and many other items of interest are exhibited.

CANTEEN.—EXHIBIT NOS. 108 AND 109.

This exhibit has been arranged by the City of Birmingham Gas Department to bring before caterers the many advantages up-to-date apparatus offers for dealing with the preparation of food in large quantities, and is well worthy of the attention of managers of works, restaurateurs, and hotel proprietors who are prepared to keep up-to-date with the great advances recently made.

Prominent in the exhibit is a 6 ft. "Sector" hot closet and carving table by Messrs. John Wright & Co, which is replete with every accessory for good service, having overhead balanced gear attached to the meat covers, and copper vessels for gravies, vegetables, &c. A smaller and less expensive hot closet, manufactured by the Cannon Iron Foundries, Limited, which is also fitted with copper receptacles, but with hinged covers to the meat dishes, is also shown.

A large "Vega" vegetable and pudding steamer, of a capacity sufficient for 200 to 300 diners, a stock-pot stand with stock-pot suitable for restaurants, a griller, and a double-cased water-jacketted 20-gallon boiler for soups or porridge, designed and manufactured by Messrs. John Wright & Co., Ltd., are also shown. The Cannon Iron Foundries, Ltd., have supplied one of their largest single cookers, a muffin or pikelet plate with polished top, and a "Modern" boiler lined inside with their special acid-resisting metal.

STANDS 110, 111, AND 112—WORKING LAUNDRY.

A practical working laundry, in which all the heat for working the different appliances is supplied by gas, proves an interesting and instructing exhibit. The demonstration has been arranged in conjunction with Mr. H. Y. Bourne, a well-known laundry expert, and comprises the following apparatus: Parkinson's gas-heated wash boiler, Davis laundry irons, a Bourne full steam gas-heated washing machine, a hydro extractor for clothes drying, and a gas-heated ironing machine. The latter, in a small size for caterers and hotels, and for small laundries, has been specially designed by Mr. Bourne for flat work. Particular attention is called to the flooring of this exhibit, which has been laid by Messrs. Marbello Limited, and which is specially suitable for bathrooms, laundries, and offices, for it can be laid on almost any base. Demonstrations of the apparatus in actual use for washing and ironing proceed continuously. A clothes dryer and airer suitable for ordinary domestic use, made by the Economic Dryer Company, is also included.

EFFECT OF COLOURED PAPER ON ILLUMINATION—STANDS NOS. 105 AND 106.

This exhibit consists of a range of eight miniature rooms, each of which is lighted by an incandescent burner of exactly the same candle power. The walls of the rooms are distempered with various colours throughout the range; the object of the exhibit being to show the important effect that the colour of the wall-paper and decorations has upon the apparent intensity of illumination, and also to illustrate that a very much greater candle power is necessary in rooms covered with wallpaper of certain colours, if it is desired to give the same degree of apparent lighting effect.

DEMONSTRATION OF GASFITTERS' ASSISTANTS' TRAINING SCHOOL—STANDS NOS. 133 AND 134.

A great deal of interest is displayed in this demonstration, which has been arranged by the Birmingham Gas Department to show to both gas engineers and the general public the work which is carried out by the students in the technical classes for gasfitters' assistants in the employ of the Department, under the auspices of the City of Birmingham Education Department at the Municipal Technical School. Here gasfitters' assistants will be seen on work which comprises lead and iron work, all types of composition, brass and lead joints, also lamp brackets, lamp arms, and general ironwork. Display is also given of the students' work in the drawing classes, and additional interest is imparted by showing the students actually engaged in drawing work. Examples of the work executed by these students during the past session are available for inspection.

The main object of the demonstration is to show the public the great care and attention which is paid by the gas undertakings to

train those who will be shortly called upon to carry out work on consumers' premises, with a view to ensuring the utmost possible satisfaction on the part of the gas user. The whole of the classes are under the supervision of fully qualified teachers who are members of the Gas Department's staff.

No. 13.—THERMAL SYNDICATE, LTD.

To the advantages of heat-proof "Vitreosil" gas globes attention is drawn at the stand of the Thermal Syndicate, Ltd. As is well known, these globes can be had in patterns and sizes to fit all types of burners in general use, including those with bayonet fitting; and they are unbreakable by heat or extreme changes of temperature. For the new cluster type of burner, these heat-proof globes are particularly adapted, as they satisfactorily resist the intense heat evolved. They are to be had artistically tinted (pink, green, yellow, or crimson), as well as in natural white; also with either glazed or matt surface. It is pointed out that "Vitreosil" globes do not appreciably cut off the light, notwithstanding their opalescent appearance, because they fit closer to the mantle, which becomes hotter and gives out more light, balancing any possible loss, so that a flood of soft restful light, without glare, results.

In connection with semi-indirect lighting, "Vitreosil" bowls, which are exceptionally light, can be made to give beautiful effects.

No. 14.—MESSRS. GEORGE WILSON GAS-METERS, LTD.

This firm are showing a varied collection of gas-meters, including glass working models of prepayment, ordinary, and stop, all of standard and light type; some of the meters being fitted with therm-calculating indices. This feature is well worthy of a close inspection. Messrs. Wilson led the way with the therm-calculating index, which simplifies reading and eliminates the necessity for mathematical calculations. The accuracy of the meters manufactured is demonstrated by a test meter fitted with a very small by-pass jet, which shows how small a quantity of gas is accurately measured.

The prepayment meters shown appear to be of a simple construction and of neat design; and the makers inform us that the valve can be set to open at 1 c.ft., thereby enabling the consumer to get the full benefit of the value of the coin inserted. They also show a stop meter which has a different construction, and obviates the use of coins. This meter is suitable for premises occasionally vacant, the consumer stating the quantity of gas required, and paying in advance for a definite supply. Hotels and boarding-houses are well catered for by a small meter which can be fixed in a cabinet near the gas-fire. A series of pressure-wave controllers for street lighting is also demonstrated. A further interesting exhibit on this stand is a fine collection of aeroplane and motor castings, in aluminium and non-ferrous metals, as used by leading manufacturers. In the production of these castings gas plays a prominent part.

No. 15.—MESSRS. JOHN & JOSEPH TAUNTON, LTD.

This firm show a patent prepayment gas-meter of their "Sun and Planet" design, for which they claim many advantages, among which the following may be mentioned: It is a meter with a readily accessible prepayment valve, inspection of which may be made without disturbing the mechanism in any way, or breaking the Government seal. There is no compound screw, and all prepayment mechanism is outside the meter.

Repairs to this mechanism can be done *in situ*. The valve is opened by the first coin at 3 c.ft.; and there is an efficient check to prevent the straining of the mechanism by the insertion of too many coins at a time. All parts are detachable and interchangeable, the aim having been extreme simplicity throughout. It is also claimed that by its use maintenance costs are reduced to a minimum, and that it can be converted into an ordinary meter in a few seconds. These points will appeal to gas officials.

By the use of this meter the cost of changing meters, in order to allow the manufacturers to carry out at their own works the necessary adjustments during the guaranteed period, will be saved. Gas undertakings doing their own repairs will effect the same economy after the guaranteed period, and add thereto by saving the expense of putting the meter right in their own shops. These savings will recur at each adjustment *in situ* during the life of the meter. There is also avoidance of dissatisfaction and loss of sale of gas to consumers, who have no need to do without gas pending the changing of the meter. It is claimed that when the meter goes into the repair shops for cleaning the valves and measuring chambers, the savings would be as follows:

(*a*) The expense of stripping-down the valve box to refit a new button—3d. to 1s. per meter, according to make.
(*b*) The expense of unsoldering the valve lever by having this detachable with screws—3d. per meter.
(*c*) Extra tinsmith's work on certain prepayment meters in stripping-down and refitting—9d. to 1s. 6d. per meter, according to make.

The average saving in wages is assessed at 1s. 3d. per repair.

No. 16.—HENRY BEAKBANE.

Everything connected with leather that goes into the gas industry is to be found on this stand. Mention may first be made of the "Fortox" meter skins, which are produced from genuine Persian sheep. Quality, texture, size, and substance are the outstanding characteristics influencing the firm's selection; and these points, combined with skilled workmanship in the shaving, fluffing, and softening of the leather, all go to produce the excellent qualities of the finished skins. "Fortox" skins are supplied in varying sizes for the different meters, in either the original vegetable tannage or chromed to withstand the deleterious action of damp and water.

"Fortox" hydraulic leathers are made in either oak or chrome tannages, and in all sizes from ½ in. to 72 in. internal diameter. Leather belting is also supplied by the firm.

No. 17.—WILLIAM WHITEHOUSE & CO., LTD.

This firm are exhibiting a well-chosen selection of brackets, and one, two, and three light pendants, including up-to-date silk shade lights, of varied designs to harmonize with the modern furnishing of dining rooms. They are large manufacturers of brass joints and cocks for lighting and heating; and they show a big quantity of these fittings, from a small cigar cock 1⅛ in. long (weighing an ounce or two) up to 3 in. gas-main cocks weighing 28 lbs. apiece. Every type of plain bracket, both for upright and inverted burners, is also to be seen. Messrs. Whitehouse draw attention to their washer-nighted cocks, fitted with their own registered washer. This principle has been approved by many of the leading gas companies.

No. 18.—MESSRS. FITCHETTS, LTD.

It is claimed by the firm that "Y – To" is the best clean-hand paste, for removing dirt and grease from the hands without injury. It will also take grease and dirt from gas-cookers.

No. 19.—MESSRS. E. PASS & CO.

There is an interesting exhibit at this stand of patent appliances for making connections to gas and water mains under pressure. There is also apparatus for drilling and tapping mains for services under pressure, together with patent gas-main stoppers and improved canvas-covered gas-bags. Further, there are ratchet screwing stocks and dies for wrought-iron, brass, and copper tubes, screwing tackle of all descriptions, along with pipe cutters, and tools for general maintenance work.

No. 20.—BRITISH COMMERCIAL GAS ASSOCIATION.

[This account also covers Exhibits Nos. 46 and 51.]

The "B.C.G.A." have co-operated to the fullest possible extent with the Exhibition Authorities in making a really comprehensive and representative display of the various branches of public service now provided by the gas industry. The important part the industry plays in conserving national resources, purifying the atmosphere, and so materially benefiting the health of the nation, is clearly demonstrated. In addition to practical co-operation in special local and district publicity, the Association have arranged various striking exhibits.

Smoke Abatement Exhibit.

A very effective display is given under the general title "The Wrong Way—Waste" and "The Right Way—Economy;" samples of bye-products—including sulphate of ammonia, benzole, coke, tar, dyes, disinfectants, perfumes, &c.—together with photographs, diagrams, and models being exhibited to demonstrate the evil and waste resulting from the use of raw coal, and the practical solution of the smoke problem which the gas industry provides. Suitable educative literature on the subject is provided for those interested.

Literature and Publicity Display.

A comprehensive display of publicity material dealing with modern applications of gas to the needs of the home and of industry, and especially designed to demonstrate the value of gas as a public servant, has been arranged. The literature includes important contributions by eminent authorities, dealing with the hygienic and other aspects of the use of gas in the solution of domestic, civic, and national problems. A representative display of "B.C.G.A." advertisements, with special features of interest alike to the public and to the gas industry, will also be on view.

Gas Showroom Windows.

Recognizing that the showroom window is one of the best mediums for attracting the public, the "B.C.G.A." have taken space in this section to demonstrate (1) how effective gas displays may be made, and (2) the service in this respect now at the disposal of members. The displays will be changed from time to time during the run of the exhibition. Photographs and particulars of hire will be available afterwards for the use of members.

Industrial Fuel Bureau.

A number of photographs and diagrams illustrating actual

installations of gaseous fuel, as applied to a number of trade and manufacturing processes, together with brief descriptions and explanations of each, is available. These records should be valuable to managers and salesmen specially desirous of increasing their industrial load, as well as to engineers and manufacturers as illustrating the large part gaseous fuel now plays in industry. Gas is employed in 64 primary trade processes and in 2706 known and tabulated trades, for an average of as many as seven processes in each.

SALES DEVELOPMENT SECTION.

This is a private information bureau devoted entirely to matters of interest to gas officials. Information regarding every section of "B.C.G.A." service is available, and gas managers will find interest and profit in a special visit and inspection. The following are the main sections of the bureau at which an Association Representative will be in attendance to offer advice and information.

Organization and Sales Service.—Details of the Association's organization and sales development service are available. This service is in successful working operation in a number of large and small undertakings throughout the country. Full information is obtainable on the stand, and inquiries are invited on the following subjects:

Complete distribution system.	Analysis of unproductive time.
Stove-shop records.	Analysis of job times.
Meter-shop records.	Processing in stove shops.
Slot collection system.	Processing in meter shops.
Costing system.	Organization of clerical staff.
Rental system.	Lighting maintenance staff.
Fitting and residual ledgers.	Detail planning of:
Higher accountancy.	Stores, offices and showrooms.
Filing system.	Stove shops and meter shops.
Lighting maintenance.	Showroom decoration and display.

Showrooms—design and equipment.—An endeavour is made to display everything of interest to the manager or salesman who is anxious to equip a new showroom or improve the appearance of existing showrooms. The Association are devoting special efforts to this branch of the service; and many new features have been introduced, particularly in regard to designing and general lay-out, equipment, poster service, showcards, and window displays.

Literature and Posters.—Specimens of the literature and various forms of posters, showcards, &c., issued and stocked by the Association are arranged in convenient form.

Specimens of Publicity.—A wide range of cuttings of "B.C.G.A." advertisements which have appeared in many of the leading newspapers, periodicals, and magazines, will be available for examination. Managers and salesmen interested in the preparation of "copy" for their local publicity will no doubt be particularly interested in this section; the service providing suggestions for copy written by experts, lay-outs of the copy prepared by experts, and blocks of drawings by first-class artists for illustrating the advertisements, all at nominal cost.

Showcards for Offices and Showrooms.—A new branch of "B.C.G.A." service is the supplying of hand-prepared double-crown showcards in colours, complete with illustrations, which are available on any desired subject. Arrangements have been made whereby they may be obtained on hire, providing for a regular periodical change. The showcards are also suitable for use in connection with Post Office advertising; and a representative display has been arranged.

Office Equipment, Stationery, and Machinery.—The Association are asked, from time to time, to obtain on behalf of members various articles of office furniture, typewriters, duplicators, and general office stationery. The following are some of the specimens shown in this section, and obtained at substantial discounts through the Association.

Typewriters.	Visible loose-leaf card records.
Office desks.	Stock records.
Filing units and cabinets.	Addressing machines.
Sorting racks.	Time records.
Plan units and bookcases.	Inter-office telephones.
Work organizers.	Carbon paper, typing paper.
Calculating machines.	Advertisement envelopes.
Loose-leaf ledgers.	Card-carrying cases.

Novelties.—Advertising novelties, such as books of matches, matchbox holders, playing cards, &c., bearing suitable gas advertisements, now stocked by the Association, are shown.

No. 21.—E. E. JEAVONS & CO., LTD.

This is a firm of mainlaying contractors; and they exhibit service-laying trucks, main stoppers, and other main and service laying equipment. There is a welding plant for mains, together with samples of joints used in laying cast-iron and steel gas-mains.

No. 22.—MELTHAM SILICA FIRE BRICK CO., LTD.

This Company are manufacturers of high-class silica bricks and blocks of all shapes and sizes, for use in gas-works, &c. A large number of samples of their goods is submitted for inspection. It may be mentioned that they make a speciality of work in connection with vertical and horizontal retorts.

No. 23.—MESSRS. GEORGE WALLER & SON, LTD.

The exhibits of this firm consist principally of photographs of their specialities—exhausters, compressors, coke breaking, elevating, screening, and washing plant, pumps, concrete machines, &c. —and examples of their work. There is a model of a four-blade exhauster, and two models of small gas-engines (one ½ B.H.P., the other 1 B.H.P.) each fitted with electric ignition. The latter will be of special interest to gas salesmen, for they are most suitable for showroom exhibition, to assist the promotion of gas sales to users of small power-units. Particular prominence is given to their patent coke-breeze washing machines and hydraulic truck-handling plant.

No. 24.—THE MIDLAND TAR DISTILLERS, LTD.

This firm's exhibit consists of samples of various coal-tar products manufactured at their works, ranging from crude products to the refined and pure articles. Several specialities for the treatment of roads are noticeable. The exhibit graphically illustrates the wide ramifications of the products obtained in the carbonization of coal. It may be of interest to know that the bulk (approximately 80,000 tons per annum) of the gas-works tar produced in the Midlands is dealt with by the Midland Tar Distillers, Limited, on behalf of the producers under a profit-sharing scheme administered by a Committee (of which Alderman J. H. Lloyd is Chairman) representing the gas undertakings and the tar distillers. Another display of interest at the same stand is that of Synthite, Limited, where are shown compounds made from condensation products of phenol, together with synthetic resin and formaldehyde. The Horticultural Department of Robinson Brothers, Ltd., also have a case at this stand demonstrating various agricultural and horticultural fertilizers, &c.

No. 25.—MESSRS. THOMAS & BISHOP, LTD.

This firm are showing the following specialities:

"Cling-Surface" and "Erusa" Belt Treatments.—The advantages obtained by treating belts with "Cling-Surface" and "Erusa" are demonstrated on a plant comprising a motor driving a countershaft by means of a leather belt running vertically. From the countershaft to a 4 KW. generator the drive is by means of two belts running horizontally; one belt being treated with the preparation, and the other untreated. Fast and loose pulleys are fitted at either end of the machine; and the increased efficiency of the treated belt is shown by means of voltmeters and a bank of lamps. When the treated belt is carrying the load, the voltage indicated is at its maximum of 200, and the lamps are brightly illuminated. When the load is transferred from the treated belt to the one untreated, the voltage immediately drops to about 120; the lamps only showing a faint red glow.

"Permac" Jointing Material.—The universal use of "Permac," combined with its efficiency and low initial cost, is aptly demonstrated by a series of joints, which include flanges, screwed piping, traps, &c. Water, at a pressure of 250 lbs. per sq. in. is employed; and joints are broken and remade throughout each day, proving the makers' claim that no time is necessary for setting when "Permac" is employed. A series of photographs depict the applications of "Permac" in coke-oven plants and gas-works where its use is strongly recommended, owing to its being able to make tight joints and to keep them in this state, even when in contact with any of the well-known acids and chemicals in coal-tar derivatives. Samples of set "Permac" are shown in test tubes containing sulphuric acid, naphtha, benzole, ammonia, hydrochloric acid, and caustic soda, in order to prove that no disintegration takes place when "Permac" is used as a jointing medium on plant where any of these acids or chemicals are dealt with.

"Flexo" Lubricating Grease.—This grease is manufactured in nine densities, which have been arrived at after careful consideration of lubricating conditions extending over the twenty-five years; and the makers claim that there is no lubrication condition in any part of the world which cannot be covered by one or other of their densities. Variation in density is an important feature. It is obvious, for example, that a grease giving good results in the gearbox of an automobile can hardly be used, or expected to give good results, if applied on the reduction gear of a 2000 H.P. rolling mill. "Flexo" lubricating grease is sold with a guarantee of purity and efficiency. In addition, the makers have perfected an economical and efficient system of line-shaft lubrication, using a neat grease cone, with a carrier rod inserted to feed the grease on to the shaft. It is claimed that their system considerably decreases lubricating costs and gives the maximum of efficiency without any of the usual disadvantages—such as oil dripping on to the workers below, or destroying any goods inadvertently placed below a bearing joint.

"Flexo" Leather and Textile Belting.—These belts are, by a unique process, treated with the firm's "Cling-Surface" preservative during the course of manufacture. Consequently they can be fitted direct, without any preparation, and will take-up full load at once, without fear of slip, and—most important of all—without any initial tension.

No. 26.—SHELL-MEX, LTD.

Among the exhibits of this firm may be mentioned that of "Mexsol." This is a straight-run petroleum distillate, with a low final boiling point, which is now being used by several gas undertakings as a solvent for naphthalene. Naphthalene troubles are still a source of anxiety to many gas managers and engineers, and technical opinion is fairly divided into two camps—one embracing those who prefer to extract naphthalene from the gas before it enters the holder, and the other supported by those who prefer to use the calorific value of naphthalene by converting the crystals into vapour which is carried along with the gas to the district. For the first class "Shell" gas oil is recommended as a washing, absorbing, or extracting agent; for the second, "Mexsol." Apart from its efficiency, the latter has the virtue of cheapness in its favour.

In employing "Mexsol" as a naphthalene solvent, two methods may be made use of: (1) Evaporating by heat, and (2) spraying. (1) In the former, some convenient apparatus must be used in which the solvent can be subjected to heat. The increase of temperature converts this into vapour, which, being carried through a suitable connection into the gas-main, is taken up by the gas and carried forward therewith to the area of supply. In this connection it is important to note that "Mexsol" is completely evaporated at the comparatively low temperature of 200° C. (2) Spraying is carried out by forcing the solvent under pressure into the gas-main through a very fine nozzle, from which it emerges in the form of a mist, which, mixing with the gas, takes up the naphthalene already deposited in the mains, thereby clearing them of this obstruction.

It is difficult to lay down a definite quantity of "Mexsol" per 100,000 c.ft. of gas, as practice and conditions vary in different gas-works. However, 10 to 15 gallons per 1,000,000 c.ft. is a safe figure on which to base calculations; and this can be decreased as the deposits gradually tend to disappear, when it will be found that about half the original quantity—*i.e.*, 5 to 7½ gallons per 1,000,000 c.ft.—will suffice to keep the mains, &c., clear. "Mexsol" has no bad effect on the special leather used in meters, as long as no condensation takes place in the meter. "Shell" chemists have carried out exhaustive tests on this leather, subjecting it to the equivalent of some years' use; and it was found that there was no decrease in pliability of the leather.

The use of gas oil for enriching purposes has been so widely developed during the past twenty years that gas engineers are now familiar with the product and the process. Also, it is becoming known that as a wash oil for extracting naphthalene from coal gas ordinary petroleum gas oil has many advantages over creosote; in particular, the fact that the oil when saturated with naphthalene can be readily passed into the carburettor, mixed with fresh supplies, and used up in the ordinary way. Much useful information on this point has been disseminated by recent papers read and discussed by the Newcastle Section of the Society of Chemical Industry. "Shell" gas oil is also much used for benzole extraction, and possesses peculiar advantages as an absorbing agent. Not only is the amount of benzole recovered per ton of coal increased, but the oil itself is not seriously affected, and can be used again and again with only an occasional addition of fresh oil to maintain the quantity. The following is the analysis of "Shell" gas oil:

Sp. gr. at 60° Fahr.	0·853
Flash point (close test)	168° Fahr.
Calorific value	20,236 B.Th.U. per lb.
Sulphur test	0·48 p.ct.
Water content	*Nil*
Viscosity (Redwood No. 1) at 100° Fahr.	36 sec.

No. 27.—MESSRS. W. GOODYEAR & SONS, LTD.

At this stand is shown the "Goodyear" patent radiator stove—the latest production of the firm, and the result of years of experience. The advantages claimed are complete exclusion of gas fumes from the work being stoved, much greater heat-radiating surface, and uniformity of temperature throughout the stoving chamber. The burners supplied are fitted with a controlling device for regulating the supply of air, the ventilating air is preheated before entering the stoving chamber, and the casing is packed with silicate cotton, thus preventing any loss of heat. Other exhibits include some of the firm's well known industrial trucks and trolleys, and gas-service carts.

No. 28.—THE HORSTMANN GEAR COMPANY, LTD.

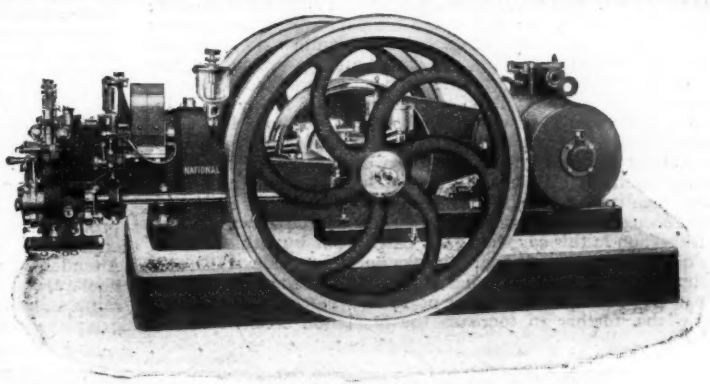
At this stand particular attention is drawn to the 3A/UNI type of automatic gas controller. This has a 14-day run. The gas cock is fitted to the supply pipe, and remains a permanent fitting. The controller is attached at the side; a key being used to lock it in position. The leading features and advantages are the same as with the well-known 3/UNI type, in which the controller and gas cock are two separate interchangeable units, which permits of any controller being instantly removed and locked on to any cock of its own type.

Type 1A is an interesting model. The time dial is an ingenious equation device which automatically adjusts the "on" and "off" times daily throughout the year, and with provision for summer and winter time. Cams are provided for any schedule which reproduce the lighting and extinguishing times required. It is interesting to note that the Cardiff Corporation have installed 2000 of these controllers. An excellent range of well-made superheated burners is shown at this stand.

Nos. 29, 30, & 31.—THE NATIONAL GAS-ENGINE CO.

It has been proved conclusively that the gasification of coal is the most efficient and satisfactory method of conserving our fuel resources. An effort has been made to demonstrate this in a practical manner by the exhibit of the National Gas-Engine Company, Ltd., of Ashton-under-Lyne and Birmingham. This exhibit consists of three "National" gas-engines coupled direct to dynamos by the Electric Construction Company, Ltd., of Wolverhampton.

The largest unit is 50 B.H.P., and is capable of producing 30 KW. or units. It is of a substantial design, fitted with self-starter, magneto ignition, forced lubrication to piston and crank pin, ring lubrication for bearings, and balance weights on crankshaft. The dynamo is capable of giving an output of 30 KW. at 220 volts, and is coupled to the engine by means of a flexible coupling. It is of the open type, compound-wound with two pedestal bearings. This engine will generate one unit of electricity for 15,000 B.Th.U. (or with gas having a calorific value of 500 B.Th.U. per c.ft., 30 c.ft. per hour)—costing 1·02d. with gas at 2s. 10d. per 1000 c.ft. The engine is only a small unit; and when it is realized that for each unit generated by a large steam turbine of a type which has recently been installed at the new Birmingham Corporation electric power station at Nechells, at least 20,000 to 25,000 B.Th.U. are required for each unit generated, gas engineers can still rightly claim they can generate power with a lower consumption of fuel than any prime-mover available to-day. A smaller unit is exhibited of the vertical type, capable of giving 7 B.H.P. with town gas, and coupled to an "E.C.C." dynamo; the whole being mounted on a combination bedplate. A unit of a different type is the 6 B.H.P. horizontal gas-engine, with chain-driven dynamo. This design combines all the advantages of the low-speed engine and the relatively high-speed electrical generator, in the minimum of space. The dynamo is driven by means of a totally enclosed silent inverted tooth chain running on machine-cut wheels.



"K.E." National Lighting Set.

For those who prefer electric light in the home, the workshop, or the stores, these engines and dynamos are ideal and economical in every way. The smaller engines would be capable of giving 5000 c.p. for under 6d. per hour with town gas at 2s. 10d. per 1000 c.ft.; whereas, if supplied from the local mains with current at (say) 6d. per unit, the cost would be 1s. 6d.

Nos. 32 & 33.—Here is the office of the Hon. Secretary of the Exhibition Executive Committee (Mr. R. J. ROGERS).

No. 34.—G. B. PARKES, LTD.

Here is to be found a big selection of "P" brand British-made malleable iron tube fittings, for gas, water, and steam purposes.

No. 35.—INDUSTRIAL RESEARCH LABORATORIES. (City of Birmingham Gas Department.)

A NEW GAS-FURNACE.

The main object of interest is a new design of gas-furnace having highly increased efficiency compared with the majority of gas-furnaces used for similar operations. It has been developed by Messrs. Gibbons, of Dudley, in conjunction with the Industrial

Research Laboratories of the City of Birmingham Gas Department, with the object of producing heating plant of a high efficiency, and to meet the special needs of manufacturers requiring furnaces with hearth areas of from 3 ft. by 2 ft. up to 12 ft. by 5 ft., for the various carburizing and re-heating operations so essential in the manufacture of components of motor cars, motor cycles, and similar steel parts. The particular furnace shown has a working chamber 4 ft. 6 in. long by 2 ft. 6 in. wide by 18 in. high, and is designed to work with town gas at ordinary main pressures—say, from 20-10ths to 40-10ths, with a natural draught.

The construction of the furnace follows very closely the design of existing large-type producer-gas fired furnaces, which have been supplied by Messrs. Gibbons Bros. for a number of years, and includes a special type of counter-current regenerator applying to both the gas supply and the air supply. The gas is admitted on both sides of the furnace into receivers rectangular in shape, which are in contact with the waste-gas flues. The receivers are provided with baffles, so that the gas is made to pass over as large a surface as possible. Thence it is carried to the combustion chamber; and it is burned from a series of firebrick port holes, playing equidistant and centrally along the centre line of the length of the furnace. The air supply is admitted under natural draught, as before-mentioned, at the bottom of the regenerator system, and arranged to pass lengthwise through regenerator blocks, playing between the waste-gas flues; the travel of the air being three times the length of the furnace, and meeting the gas at the firebrick nostrils. The gas and air mixture now passes under the working floor bed into channels at the side of the furnace, and into the working hearth itself by a series of port holes.

The waste gases are taken from the working hearth by flues playing at the back and the front, and are carried into the waste-gas flues in the regenerators, collecting into one main flue at the bottom. All gas and air supplies and waste-gas flues are independently controlled by dampers, providing a simple and effective means of regulating the end-to-end temperature of the furnace; and each flue is very easily inspected. It is quite a simple matter to obtain either an oxidizing or reducing atmosphere in the furnace chamber, as required by the particular work being done.

Recent tests carried out on a furnace 4 ft. 8 in. by 2 ft. 6 in. by 18 in. gave a gas consumption of 700 c.ft. per hour for maintaining a load of 10 cwt. of cast iron at a temperature of 925° C. The ordinary firebrick work has been constructed of firebricks manufactured by Messrs. Gibbons (Dudley), Ltd., and particular mention should be made of the insulation. Radiation losses through furnace walls are a serious source of waste; and the insulation in this case has been carried out by a thickness of 6 in. of Newall's "Nonpareil" bricks on the outside walls and the top of the furnace; and between these and the outside steel casings has been placed a layer of 1½ in. "Newtempheit" magnesia slabs, further to increase the insulation efficiency.

The furnace at the exhibition is shown under actual working conditions with a charging machine; and case-hardening and re-heating of various motor gears and component parts will be demonstrated during the period of the exhibition. Thus visitors and interested manufacturers will have a fine opportunity of seeing what this particular furnace will do; and it may also be taken as an excellent example of the application of town gas to industrial operations.

Connected with this furnace will be shown both a thread recorder and an ordinary type of wall indicator using platinum platinum-rhodium thermo-couples, as supplied by the Cambridge and Paul Instrument Company, Ltd. The workmen in charge of the furnace will be using these instruments for controlling various temperatures required.

The photograph illustrates a large furnace, of the type referred to above, which has just been installed in the hardening shops of the Moss Gear Company, Birmingham. This furnace is now running continually day and night in connection with carburizing and re-heating works for motor gears and components.

A Gas-Heated Tube Furnace.

The gas-heated tube furnace designed by Dr. C. M. Walter has been shown and demonstrated several times previously; but another opportunity is given to make an inspection of this particular apparatus, which is being used in many works for the special treatment of steel components, and also largely for such articles as steel penholders, gramophone points, needles, &c., without oxidation and with a minimum amount of distortion. The work is suspended in a highly refractory tube heated externally by means of high-pressure gas-burners. Through this tube a sealing gas is passed, and is burned at the top, thus excluding all possibility of air entrance.

Many different types of work will be available on the stand; and anyone interested will be able to see this furnace under operating conditions. It may also be mentioned that the furnace will be pyrometrically controlled.

Samples of Work Done in Gas-Furnaces.

As an interesting addition to this stand, a showcase has been arranged with a number of samples of work taken from the multifarious industries of Birmingham, which in their various heat-treatment operations use town gas as a fuel. This will show the various types of lamps in stages of manufacture, aluminium products, cycle parts, and some very fine examples of ordinary enamelling and highly artistic jewellers' enamelling work. Attendants on the stand will be pleased to give full particulars, either of the furnaces shown or, in the case of the work samples, information regarding the particular part which town gas plays in the building-up of the article.

REGENERATIVE TYPE OF NATURAL DRAUGHT GAS-FURNACE OF RECENT DESIGN.

Nos. 36 & 37.—GIBBONS BROS., LTD., AND GIBBONS (DUDLEY), LTD.

The firms are exhibiting a machine-made fireclay retort, one made from siliceous material containing 84 p.ct. of silica, and a segmental retort built up of 95 p.ct. silica. The well-known "Gibbons & Masters" "A.B.C." regenerator tiles and tubes are also shown. Another exhibit is a working model of a retort-charging machine and a model retort-setting built to a scale of 3 in. to 1 ft. Among other interesting features of the stand may be mentioned a full-size "Meade's" patent grille grate built into a section of a producer, a seal valve of "Meade's" patent reflux-system gas-valves, producer gas-valves, an elevator chain, a hot coke chain, and producer doors and frame.

No. 38.—CONSETT IRON COMPANY, LTD.

This Company own a new works specially laid out for the manufacture of refractories for gas-works and coke-oven installations. The principal exhibits are of 95 p.ct. silica material; the makers claiming that their method of manufacture and rigid scientific control thereof gives a silica product free from permanent or after expansion. Of firebricks, semi-siliceous bricks, and shapes for the gas and coke-oven industries, special samples are laid out for inspection. Two 8 ft. lengths of 24 in. by 18 in. 95 p.ct. silica segmental retorts are on view—one length being built up with the cement specially compounded by the Company, and the other length laid up without jointing material, to show the accuracy of shape, this being one of the features of the "Consett" material. Pieces of ganister mined from the Company's own quarries can be seen, as well as a table of test-pieces and various other interesting specimens from their refractories laboratory.

The test-pieces from the under-load furnace are of particular interest, as illustrating the gradual collapse of fireclay and semi-siliceous material over a considerable range of temperature before the final fusion; whereas 95 p.ct. silica material carries its load until the temperature approaches the melting-point of the product. Samples of coke-oven shapes in 95 p.ct. silica material are on view, being specimens from an order of 3500 tons recently completed. The retort sections shown are similar to those supplied to one of the foremost gas companies in the country.

No. 39.—W. CANNING & CO., LTD.

This firm demonstrate a complete electro-plating plant, suitable for re-tinning dirty and rusty cooking-tins, for the copper and silver oxidizing of gas-fittings, &c. In addition, they exhibit polishing lathes, emery grinders, overhead buffing machines, flexible shafts, polishing mops, circular polishing brushes, steel-wire brushes for stove parts, &c.

No. 40.—MESSRS. SILAS HYDE.

Samples of gas-heated enamelling and japanning stoves are shown. The firm are also makers of gas-heated solution vats.

No. 41.—CAFÉ, MESSRS. A. D. WIMBUSH & SON.

No. 42.—BRITISH FURNACES, LTD.

Among many exhibits, this firm are showing one of their "surface combustion," type "A," oven furnaces designed for operation over a wide range of temperature (from 600° to 1350° C). This is suitable for a great variety of work, especially for the heat-treatment of carbon tool steel and high-speed steel. The furnace is built with a substantial casing of cast-iron and steel, mounted on cast-iron legs, and is lined with first-grade firebrick backed up with ample insulating material. A flue opening is provided in the arch, and a pyrometer opening in the rear wall. Attention is called to the patented door-lifting mechanism with which the furnace is equipped. A "surface-combustion" portable rivet heater—widely used in leading shipyards—combines many advantages, such as accessibility of rivets, rapidity of heating, economy of fuel, control of temperature, and minimum of scaling.

A cone fusion furnace of an excellent type is exhibited. Temperatures as high as 1710° C. are required for testing silica. It is usually difficult to obtain uniform temperatures of round about 1710° C., even in a small cylindrical furnace (say, of 6 in. to 9 in. dia.), and flame contact is difficult to avoid. The atmosphere is also not under control. For these reasons electrical resistance tube furnaces have been used; but a gas furnace is much to be preferred. The refractory furnace shown is in the form of a cylindrical crucible covered by a loose-fitting truncated cone; both being highly infusible. They are surrounded by granular refractory material, among which a theoretical mixture of air and gas is burnt. The furnace is made in two sizes. In the smaller there is sufficient room for five 1-in. cones, and in the larger for twenty 1-in. cones. Even temperatures are attained as high as cone 36—rapidly if desired—with the minimum consumption of gas. Temperature measurements may conveniently be taken through the hole provided for the purpose by means of an optical pyrometer. There is no possible chance of flame impingement on the test-pieces, and the atmosphere in the furnace may be made to conform to that found in actual practice.

A model of a water-gas plant suitable for small gas-works is displayed, which is very pleasing in the soundness of its construction. The rest of the exhibit is comprised of various specimens of "surface-combustion" burners, and air-gas proportioners.

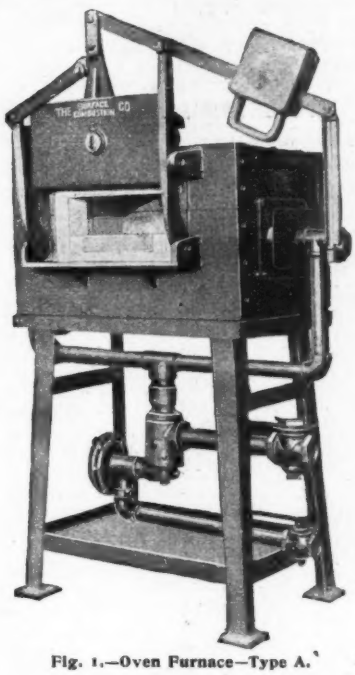


Fig. 1.—Oven Furnace—Type A.

If one end of a bar of iron is heated and the other kept cool, the heat absorbed at the hot end will flow by conduction to the cold end, the rate of flow depending on the rate of absorption at the hot end, the length of the bar and its cross-section, and the temperature of the cold end. This is the principle on which the design of "surface-combustion" gas-burners is based. They are one-piece iron casings, so arranged that, when set in place, only a minimum surface of metal is exposed and can absorb heat

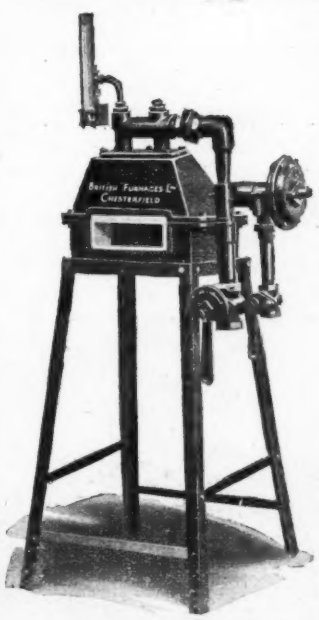


Fig. 2.—Portable Rivet Heater.

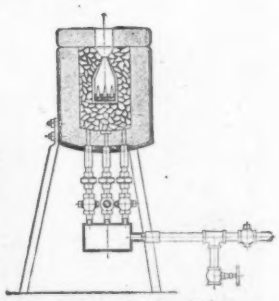


Fig. 3.—Cone Fusion Furnace.

from the furnace. A sufficient cross-section is provided to conduct back to the outside of the furnace the heat so absorbed. In this manner, the tip or nozzle is automatically kept uniformly cooled. When the heat has been drawn by conduction through the solid cross-section of the casting to the outside of the furnace, it is dissipated to the surrounding air by means of cooling fins. The fins set up a thermo-syphon action which constantly draws cold air over their surfaces and extracts the heat from them.

No. 43.—THE WOODALL-DUCKHAM VERTICAL RETORT AND OVEN CONSTRUCTION COMPANY (1920), LTD.

The exhibit of this Company includes a full-size section of one of the Woodall-Duckham vertical retorts. It is constructed in silica material, and shows the design which is the outcome of long experience, and which has been adopted to give great strength and to reduce the liability of gas leakage to a minimum. The section is built-up dry, so that the bricks can be taken apart, and the actual bonding at any point inspected. There are also exhibited large-scale coloured diagrams, showing typical arrangements of Woodall-Duckham plants, and a number of photographs of recent installations.

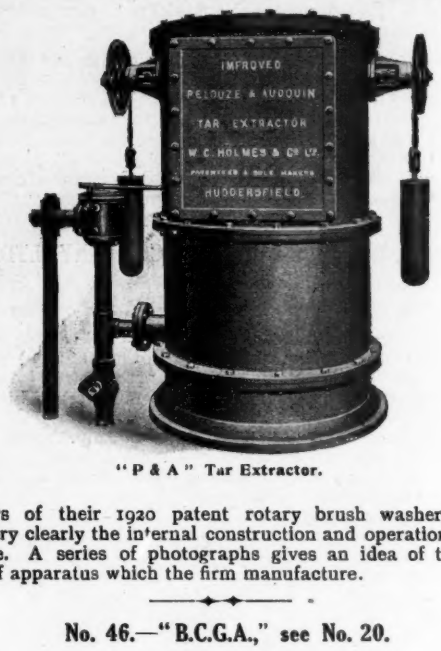
No. 44.—THE BRYAN DONKIN COMPANY, LTD.

This firm are showing the latest models of their two-blade and three-blade exhausters. The first type of exhauster made by the Company was patented by J. Beale in 1866. The main defect of this type was the large amount of friction produced by the guiding rings running at a high linear velocity; and, in addition, the compound slide was a source of weakness, and required frequent renewal. This type was displaced by an improved form, in which the guiding rings were abolished. In the pattern demonstrated the guiding of the motion of the slide is brought to the centre of the machine by the use of a block which runs on a pin fixed in one of the endplates. By this arrangement the slides can be cast in one piece, and very much larger wearing surfaces can be provided. In addition, the relative velocity of the guiding surfaces for a given diameter of shell is only a tenth of that of the rings running in the endplates of the old type. As a consequence, the internal friction of the machine is so much reduced that tests have shown the power required to be 33 p.ct. less than for the guiding-ring exhauster. The exhauster cylinder is bored to the exact oval shape described by the slightly eccentric movement of the slides or blades. As, however, this movement is entirely guided by the central block in conjunction with the axle, no wear takes place on the cylinder. In some cases machines are preferred having three or four blades, owing to the oscillation of the gauge on the inlet side during a revolution of the exhauster being somewhat reduced at slow speeds by the increase in the number of blades; but this question has ceased to be of importance, owing to the adoption of the retort-house governor. Messrs. Bryan Donkin manufacture exhausters of this type for all capacities.

Another interesting exhibit is a specially light type of regulator for direct connection to either gas-meter inlet or outlet, with a removable top cover for adjusting the outlet pressure. A brass cap and lining can also be fitted to the outlet of the generator for this purpose. The regulator is suitable for inlet pressures not exceeding 8 in. water pressure, the outlet pressures being adjustable from 1 in. to 3½ in. Two types of street-lamp regulators are demonstrated; one for low and the other for high pressures. The latter is suitable for any inlet pressure up to 10 lbs. per sq. in., and any outlet pressure from 1½ to 4 in. Other exhibits include gas-fire governors, service regulators, and various lubricators for exhausters.

No. 45.—MESSRS. W. C. HOLMES & CO., LTD.

This well-known Huddersfield firm are exhibiting models of their improved double-faced "Western" valve, which is extensively used throughout the gas-works of the country, and also a model of an improved "P & A" tar extractor, from which the water-seal column has been eliminated. The counterbalancing is effected by means of weights on wheels fixed on the shaft passing through stuffing boxes. They also show a model of the "Davidson-Liversedge" centrifugal washer, of which they are the sole manufacturers, and which is highly efficient in the extraction of ammonia and benzole. They also display two



"P & A" Tar Extractor.

cylinders of their 1920 patent rotary brush washer, which show very clearly the internal construction and operation of this machine. A series of photographs gives an idea of the wide range of apparatus which the firm manufacture.

No. 46.—"B.C.G.A.," see No. 20.

Nos. 47-50.—CO-OPERATIVE STAND.

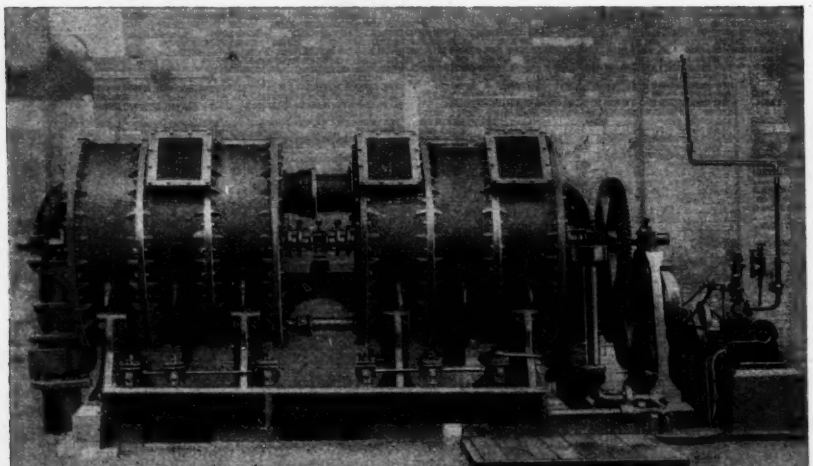
The exhibit arranged by the Midland Gas Undertakings takes the form of a series of model rooms, and has been designed to show up-to-date fittings and apparatus in home surroundings.

Bathroom.—The bathroom appeals because of its simplicity, taste, and utility. White steam-proof furniture and accessories, the plain and efficient gas-lighting fittings, and the "New Treasure" geyser (Parkinson Stove Company) fitted to the bath, combine to meet every requirement. Hot water is also supplied to the bath from a "B.T.U." circulator fitted in the kitchen.

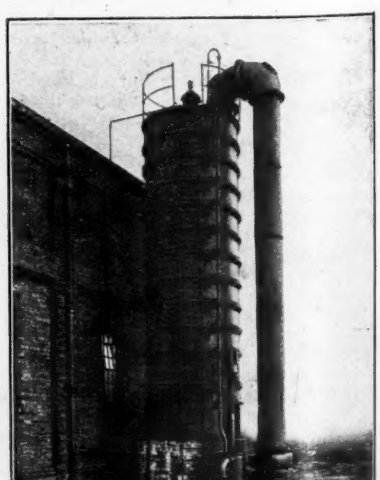
Bedroom.—The bedroom, fitted with a Jacobean oak suite, is fitted with a "Louis" fire (Richmond Gas Stove and Meter Company, Ltd.) with kettle boiler, in art-copper finish. The gas-fittings are arranged for convenience of lighting effect, and are complete with old-rose shades, which have a very pleasing effect. There is also a table lamp at the bedside, giving a general appearance of cosiness, comfort, and utility.

Nursery.—The nursery, with its white simple furniture, has an air of cleanliness and brightness, which cannot help but appeal to all who are interested in the care of the young. The gas apparatus includes a 12-in. "Swastika" fire (Messrs. John Wright & Co., Ltd.), in the new oxidized-silver finish, and is complete with an attached kettle holder. The lighting arrangements are well conceived for general illumination.

Lounge.—This is particularly striking; the suite being of plain mahogany with a Grecian design. The gas-fittings in harmony are finished in oxidized silver; the centre 4-light pendant being



Rotary Brush Washer.



Centrifugal Scrubber.

furnished by Messrs. Whitehouse & Co., Ltd., and the brackets, with candela burners and floor lamp, are handsome examples of Messrs. Evered & Co.'s productions. The fire shown is the "Chatsworth," by the Parkinson Stove Company, Ltd., in armour-bright finish. The decoration is completed by the handsome old-gold shades, which are a decided addition to the well-appointed exhibit, and amply demonstrate the artistic merits of suitably-designed gas-lighting fittings.

Kitchen.—The kitchen—always the centre of interest to the housewife—shows how completely everyone can be catered for by using up-to-date gas appliances. One's attention is particularly drawn to the "Maintop" cooker, by Messrs. R. & A. Main, Ltd. In this model, the oven and hotplate being on the same level, the ease and saving of labour to the cook is much appreciated. There is also a "B.T.U." circulator, by Messrs. John Wright & Co, supplying hot water to the sink, and which also provides hot water for the bathroom at the other end of the stand. For use when the "B.T.U." is not in action, a "Gacylette" boiler, supplied by the Parkinson Stove Company, Ltd., is fitted over the sink. By this means a supply of hot water for culinary purposes can always be at hand. The "Davis" gas-iron, fitted to a bracket on the wall, and a plain 2-light fitting with opal shades, complete the gas-installation.

The furnishing of these model rooms has been carried out entirely by Messrs. Alfred Allen, of Birmingham, with the exception of the bathroom and kitchen, which have been arranged and supplied by Messrs. Parker, Winder, and Acburch, Ltd., also of Birmingham.

No. 51.—"B.C.G.A.," see No. 20.

No. 52.—GENERAL GAS APPLIANCES, LTD.

In the gas-fire section, the exhibit of this firm includes, in addition to their well-known lines, a new series of inset and side-ventilating fires of pleasing and attractive design—the "Leader," the "Leader Cover," the "Jannock," the "York," the "Addible"—all of which may be fitted with either curved or straight "Silent-Intense" simplex and duplex burners, and patented gas-adjusters of unique design, which, with the new "Instanglo" radiants, combine to give excellent results. The fires are shown in a variety of finishes—eggshell black, high gloss black, oxydized copper, oxydized silver, gilt, gunmetal, &c. The "Companion" gas-fire hearth burner, which is also shown, is a useful accessory to any gas-fire. A new and distinctive type of treble-tube loop radiator, embodying special features, is demonstrated. In the gas-cooker section, the "All British," the "General," the "Recess," the "Barnone," the "Bantam," the "Eye-Level," and the "Twin" cookers are to be seen. The C 414½ cooker, complete with "Trinity" burners, is shown in actual working, and provides much interest.

No. 53.—THE PARKINSON STOVE COMPANY, LTD.

This exhibit embraces a wide range of the latest types and patterns of gas-heated labour-saving devices for the home; cookers, grillers, wash-boilers, fires, radiators, circulators, water heaters, and geysers being shown.

The "Cabinet" gas-cooker, with oven and hotplate at a convenient height for easy use, is excellent in design, and will make an extensive appeal to all housewives who appreciate the elimination of stooping and lifting during working operations.

The "Holborn" cooker, made in four sizes, and fitted with high-efficiency boiling burners, is a high-grade production which reflects all those little refinements in construction that make gas cooking convenient and pleasurable. The "Suburbia" gas-cooker is produced to meet the demand for a high-grade cooker of pleasing design and finish. The example to be seen at the stand shows the tiled-pattern enamelled exterior, which allows the cooker to be kept clean with the minimum of labour. Other gas-appliances of high merit are to be seen in the "Liverpool" and "Kennington" series of gas-cookers, the Parkinson radiators with new patent sight feed-water level, and the Parkinson-Maughan geysers, the latter including the well-known "Teba" and "Treasure" series. Architects will find much to interest them in the exhibit of the "New Cottage" water heater, the "Built-in" gas-fire, and the "All-Cast" wash-boiler.

In the gas-fire section, the patent "Conrad" (convection radiant) gas-fire is a distinct advance in gas-fire construction, and is particularly noteworthy. Hygienically, this fire is perfect, and it combines with refined and artistic design a high standard of efficiency. Special attention is also directed to the "Westminster," "Minster," "Haddon," and "Chatsworth" models—a series of gas-fires eminently suited to modern styles of house decoration.

THE STANDARD COOKER OF THE NATIONAL GAS COUNCIL.

The No. 2 and No. 3 standard cookers, with the stands, plate racks, and other equipment, are shown in a room in the Exhibitors' and Engineers' Club, and are not available for view by the general public. Engineers and administrators of gas undertakings are invited to inspect the cookers in this room. A representative will be in attendance during the whole of the run of the exhibition, to explain points to those interested. The National Gas Council have decided not to show the cookers in public until such time as they are available in quantities for sale.

These cookers, it will be remembered, have been produced after considerable research work carried out by a Special Committee appointed by the National Gas Council, whose exhaustive inquiries into the requirements both of gas engineers and of the public have resulted in a gas-cooker of increased efficiency and economy, with a minimum number of parts, and consequent low maintenance costs. In their investigations, the Committee retained one definite aim—namely, the standardizing of a type of cooker that would be highly efficient, yet simple of construction, without unnecessary duplicated units and multiplicity of sizes. It is interesting to note that the Committee have adopted an improved form of drilled ring burner, as it has been found from exhaustive tests, not only in the laboratory, but in the actual use of the burners in dealing with the daily cooking of the household, to be the most efficient, when all factors have been taken into consideration.

The cooker has several features which will appeal to the gas engineer and the consumer. Special attention has been paid to the volume of air passing through the oven, to ensure that the useful heat units are not carried away too rapidly from the oven. There is a safety locking tap on the oven gas supply, which is simple in operation and effective for the purpose for which it is designed. The drilled grill burner is notable for the even flame which is obtained throughout the length of burner, ensuring uniformity of heating when used for grilling purposes or for toast making.

Addenda to the original specification of the Gas Appliances Specification Committee for the standard cooker will shortly be published by the National Gas Council, giving further particulars of research work which has been carried out by the Committee since that specification was issued.

No. 54.—MESSRS. STEWARTS AND LLOYDS, LTD.

On this stand is a comprehensive exhibit of wrought-iron and steel tubes for the conveyance of gas, water, steam, compressed air, &c., with all the necessary fittings. These tubes, ranging from ⅛-in. to 48-in. bore, are manufactured either by the lap-welded, buttwelded, or solid-drawn processes—according to size and quality. The following exhibits are worthy of particular attention. (1) Specimen tube, 16-in. dia. bore, with Stewarts' patent long-sleeve welded joint shown in section. Tubes with this type of joint are now being extensively used for long lines of gas, air, water, and sewage pipes; the joint being welded together on the site by the oxy-acetylene method. (2) Specimen tube, 15 in. dia. bore, with inserted joint for lead and yarn, shown in section. This tube is coated with Dr. A. Smith's solution, and wrapped with hessian as a preventative against corrosion, &c. There are also samples showing the various forms of coating and wrapping. (3) Specimen tube with branch service, together with a complete set of fixing tools. (4) Specimen concrete-lined wrought-steel lapwelded tube, 24-in. bore, for water mains, &c. (5) Specimen high-pressure steam pipes for working pressures up to 350 lbs. per sq. in. (6) Gas, water, and steam quality fittings of every description. In addition to the above, there is also a very interesting collection of different types of flanged and other joints for showing the various methods which can be employed for connecting pipes; most of these joints being in section.

No. 55.—THE WELSBACH LIGHT COMPANY, LTD.

The principal demonstration of this firm is the manufacture of the well-known Welsbach gas-mantles, from the knitting of the stocking from ramie silk yarn to the drying, packing, and gratis distribution of the finished mantle. This is undoubtedly the most complete demonstration of its kind ever publicly given. The processes shown are as follows: Knitting, sewing, fixing, seasoning, dipping or collodionizing, and packing. We would here remark that the total processes which Welsbach gas-mantles undergo are twenty-two; and it will be readily understood that the operations shown at the Exhibition are only such as lend themselves to public interest. The other processes are the washing and drying of the fabrics after knitting (a highly important operation), impregnating the fabric with a solution of rare earths (thorium, &c.), cutting to various sizes, and stamping. In addition to the gas-mantle demonstration, there is a special collection of new designs of the efficient and economical Welsbach-Kern radiators, burners, pendants, brackets, glassware, and other incandescent goods supplied by the Company.

No. 56.—HERBERT JONES & SON.

This firm cater principally for gas companies. A speciality of theirs which is meeting with a great deal of favour is a new patent non-corrosive burner. In addition to being non-corrosive, the burner is made in an enamel finish, and also in a bronze finish for slot fittings. There is no china introduced into the

construction, which renders it unbreakable. It is supplied in three-burner size with a superheater for semi-indirect lighting. There is on the stand a fine show of pendants and brackets of good quality and artistic style.

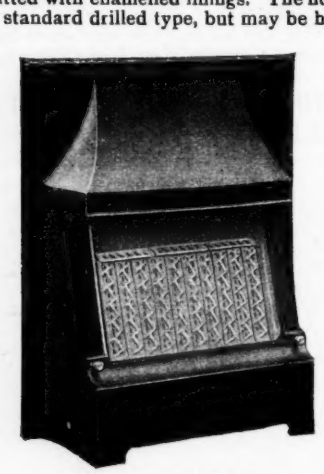
The exhibition is extensively lighted by this firm's burner.

No. 57.—THE CANNON IRON FOUNDRIES, LIMITED.

The gas-appliances exhibited on this stand are remarkable for their excellent finish. Among the cookers the "Challenge" is the most up-to-date model, and contains all the best points of practical construction. It embodies numerous improvements, both in regard to the hotplate and oven. Special care has been taken to obviate ledges and receptacles on which dirt and grease may

The "Challenge" Cooker.

lodge; and thus the cooker is rendered hygienically sound. The "Challenge" is fitted with white tile pattern enamelled exterior sides and door panel, imparting a beautifully clean appearance. The oven is double-cased, packed with non-conducting material, and fitted with enamelled linings. The hotplate burners are of the new standard drilled type, but may be had of the fan-



The "Holbeach" Gas-Fire.

flame type if preferred; and the cast top bars are of open design, thus allowing the flame to come into direct contact with the vessel. The burner taps are at the front, and include gas and air regulators. The oven tap is fitted with a gravity locking device. Each cooker is supplied on a stand with enamelled top. Other cookers exhibited include the "New Duke," the "Ophir," the "Primo," the "Cot," and the "Cottage."

The gas-fires shown are constructed on the new inclined principle, with sloping radiants, thus directing the heat towards the body, in addition to the feet. The burner consists of two parts only, and is not fitted with steatite or other fragile material. The injector is most simple, having only three parts, but is exceedingly efficient; and there is no hiss or whistle, no matter how the gas or air is regulated. There is no smell, all requirements of hygiene being perfectly met. Eminent engineers throughout the country have submitted these fires to exhaustive tests, with most gratifying results. The general appearance may be gathered

The "Boscobel" Gas-Fire.

from the accompanying illustrations of the "Boscobel" and "Holbeach" fires. With regard to wash-boilers, the "Modern type displayed is an all-cast boiler specially designed for service and durability. It has a cast-iron outer case, and is fitted with a cast-iron inner pan treated with acid-resisting enamel. In addition to the items mentioned, other gas apparatus—radiators, grillers, boiling burners, &c., to meet all requirements—are shown.

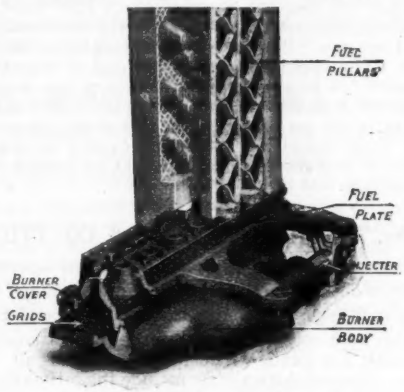
No. 58.—MESSRS. R. & A. MAIN, LTD.

This firm make a special display of their "Cinderella" gas-fire, with special test meter attached, in an elaborate fireplace. Outstanding features of this fire are its remarkable likeness to a coal-fire, and the ease with which it can be applied to modern grates with adjustable canopies. The other inset fires shown are

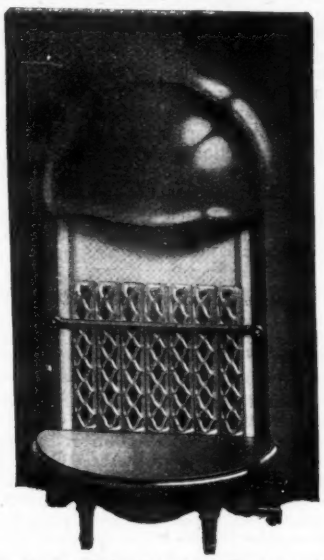
The "Mainstay" Cooker.

the famous "Entente" series, with and without dogs, the "Poet" series of gas interiors, and the well-known "Author" fires, in a variety of shapes and finishes. All the foregoing are fitted with

the new silent burners. Of cooking apparatus the "Maintenance" cooker and the "Mainstay," in a variety of sizes, are shown; and the "Maintop" cooker, fitted with hot closet, plate rack,



The "Main" Gas-Fire Burner.



The "Thackeray" (one of the "Author" Fires), with Boiling Burner in Trivet.

and backplate, forms an important part of the exhibit. At the side of the latter an "Energy" boiler, complete with tank, is in operation. There is in addition a large variety of grillers, gas iron-heaters, hotplates, gas firelighters, and boiling burners.

No. 59.—BRITISH SULPHATE OF AMMONIA FEDERATION, LIMITED.

This firm have an ornamental exhibit, which consists of a central fountain, surrounded by lawns and flower beds, demonstrating the effect of applications of sulphate of ammonia. Round this there is a low stand, on which are exhibited roots, such as mangolds, turnips, swedes, sugar beet, &c., together with specimens of vegetables grown by the aid of sulphate of ammonia. Samples of neutral and ordinary sulphate are shown. Literature regarding the use of this fertilizer on farm and garden crops, and as a spray for corn field weeds, may be had at the stand.

No. 60.—CITY OF BIRMINGHAM GAS DEPARTMENT, See No. 12.

No. 61.—THE COIN-CHANGE COMPANY, LTD.

The change-giving machine exhibited by this Company is a small and sturdily-built device easily affixed at small expense to any make of meter in place of the existing coin-box. It consists of a metal tube holding a maximum of 15s. in coppers, into which pennies can fall in an upright column. An additional slot at the side for the insertion of shillings is placed immediately above a ratchet escapement, through which the shillings must pass before falling into the container. The effect of the release of this ratchet is that a small slide, with a groove to hold pennies, may be pulled out twelve times, each time allowing a penny to be withdrawn. After twelve releases the slide becomes automatically locked again. The device is essentially robust and simple in construction, and will last for years with ordinary usage. The appeal to the consumer is very real, for the shortage-of-coppers difficulty is obviated by the fact that the device ensures an endless supply of change from the meter itself. Even if the latter contains less than twelve coppers, any number of pennies in the box may

be withdrawn up to twelve—once a shilling has been inserted. This means that if only one shilling and one penny are available, gas up to the value of one shilling may be obtained. On the other hand, if the meter contains (say) eleven pennies, and only one pennyworth of gas is required, the remaining coppers may, if desired, be withdrawn for other uses. This change-giving machine makes it impossible for the meter to become choked with coppers, as the number can always be reduced by inserting a shilling. This means that the meter is never out of use, and that householders are always able to obtain gas while awaiting the visit of a collector to empty the box.

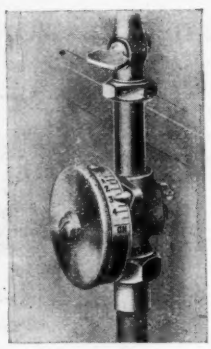
Great economies in collecting, handling, checking, and banking can be effected by fitting this attachment. A five-shilling bag of copper weighs as much as a bag of silver containing £5. The fact that the consumers are never obliged to do without light or heat owing to shortage of coppers means a considerable increase in the total receipts in large districts. At the same time, the ability of householders to make use of the meter as a savings bank for coppers required for any purpose whatever, cements and increases goodwill. The initial outlay incurred by fitting the change-giving machine is small compared with the economies effected.

Nos. 62-69.—RADIATION LIMITED.

The firms which constitute Radiation Limited are well represented. The opportunity has been taken of showing a wide selection of the Radiation standard goods; and there is a particularly fine exhibit of the recently introduced "New World" gas-cooker. It will be remembered that this cooker may embody a

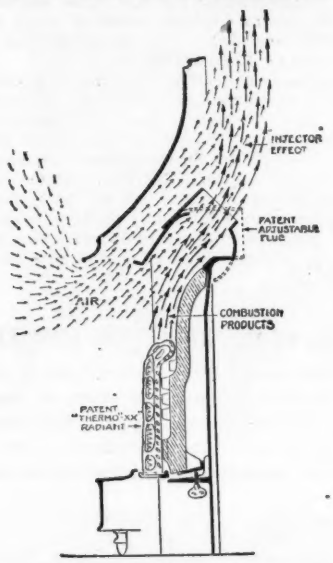
The "New World" Cooker.

novel control device—namely, the "Regulo"—by which the most refined results in cooking can be certainly attained without any trouble and without any need for watching. The head of the "Regulo" is engraved with index numbers, and the dial is simply rotated until the pointer is opposite the number given in the cooking chart provided. The oven burner is then lighted, and, after ten minutes or so, the food is inserted in the oven. At the expiration of the time given on the chart, the food will be found to be perfectly cooked; in the meanwhile no watching is necessary. It can easily be believed that the introduction of this control device is rapidly popularizing the "New World" cooker. It may be added that a development in this cooker, in which the oven is placed beside, and not under, the hotplate, and under which a rack for pans, &c., is provided, is also demonstrated.



The "Regulo" Head.

The representative range of the Radiation pattern standard gas-grates, as manufactured by the six firms comprising Radiation Limited (Arden Hill & Co., the Davis Gas Stove Company, Ltd., Fletcher, Russell, & Co., Ltd., the Richmond Gas Stove and Meter Company, Ltd., Wilsons and Mathiesons, Ltd., and John Wright & Co.), is shown. Here are some of the latest patterns of artistic firefronts. Most of these have a very strong appeal to architects.



"Injector Ventilator" Diagram.

Though a combined exhibit of these six firms provides a very diverse range of gas-grate designs, it should be noted that, owing to the system of standardization, all working parts are interchangeable with all other standard grates made by Radiation Limited firms. They embody two outstanding patents; the first being the Radiation "Injector-Ventilator," which is being widely advertised as helping very considerably to popularize the gas-fire in the living-room. Radiation gas-grates have two openings under the canopy; and it is claimed that the lower or "injector" opening carries away the entire combustion products, and that the upper or "ventilating" opening carries away a large volume of air drawn from the room. The ascending current through the lower outlet promotes, by injector action, the ventilating function in the outlet above. The result is that, while pure radiant heat is distributed throughout the room, the air of the room is changed a sufficient number of times to ensure an agreeable and healthy atmosphere.

"Thermo XX" Radiants.

These gas-grates are also fitted with the Radiation patent "Thermo XX" radiants. The latter are a distinct advance on the old pattern, inasmuch as the loose top piece is entirely dispensed with. Moreover, the design of the radiant is such that more efficient combustion is obtained, with consequently increased heating power. The makers claim that these gas-grates give the utmost possible efficiency, being soundly constructed and very considerably reducing the cost of maintenance.

The popular "Sunbeam" gas-fire is given a special show; and improvements introduced into its design are displayed and demonstrated. A happy combination of exhibition work has been effected by the Nautilus Fire Company, who have provided a distinctive replica of a gas company's showroom-front and fittings, in which are displayed some instructive exhibits. Radiation Limited have done their utmost towards making the Exhibition as full of interest as possible.

MESSRS. GEORGE GLOVER & CO., LTD.

Messrs. George Glover's stand is evidence of the recent progress which has been made in gas-meter invention. The exhibit includes, among numerous subjects of great interest, a conspicuous display of their new "Ranelagh" gas-meters for hotels, boarding-houses, &c. The opportunity thus afforded of examining these meters cannot fail to attract the attention of gas engineers. A 150-light meter (capacity 900 c.ft. per hour) is also shown registering correctly the gas passing through a single burner of about 6 c.ft. per hour capacity. The whole exhibit is complete and comprehensive, and should on no account be missed by visitors to the Exhibition.

No. 70.—MESSRS. EVERED & CO., LTD.

This well-known firm exhibit a large range of lighting fittings. Representative designs of brackets, one-light pendants, two, three, and five-light fittings, semi-indirect and shade pendants are on view, together with main cocks, gas-stove fittings, and a general range of small gas-joints. Inverted burners of all types are also shown. Specialities on view include the "Everite" lighting service burners and fittings, which are equally applicable to street lighting, the lighting of public buildings, and domestic use. The burners are shown in conjunction with shade pendants and semi-indirect fittings; the resulting effect being lightness of design, coupled with high efficiency and general utility.

The "Everite" gas candle is also exhibited on various fittings; and here again, efficiency of lighting power combined with elegance of design is apparent. A new ball joint, the "Everite," is also exhibited, and the makers claim that it is the "last word in ball joints." The Exhibition club room has a scheme of lighting carried out by the Company, and the fittings include the above specialities. The cooking demonstration room is also lit by means of this firm's fittings and burners. Simple fittings have been installed; and the whole of the burners used are of the "Everite" lighting service range.

No. 71.—THE SUTHERLAND METER COMPANY, LTD.

The major portion of this firm's stand is occupied by workmen demonstrating the manufacture of tin-cased dry gas-meters. These workmen, who are skilled tinsmiths, are engaged in the building-up of prepayment meters from tin stampings made from high-class charcoal tinplate.

The first process is the construction of the valve plate—the most intricate and vital part of a meter. Great care has to be taken in making this, for upon its accuracy depends the correct working of the meter, and proper measurement. The valves themselves are cast from a special alloy of pure tin and antimony, immune from corrosion. After the valve plate is made, the outside case is soldered together; the seams being well sweated to make them gas-tight. The division and valve plates are then fixed into their appointed places, and the first stage is complete.

The case then passes to the workman who fits the diaphragms, galleries, backs, and fronts. The diaphragms are fitted by the most approved process; the leather being banded on to tin rims without any soldering, thus avoiding all risks of scorching leathers with the hot soldering iron, and doing away with sewing and its liability to give way under the stress of working. The leather discs are cut from the finest selected Persian sheepskins, which have been semi-chrome tanned and dressed with an oil preparation mixed to a certain specification.

The next stage brings the meters into the hands of skilled fitters, whose work it is to solder-in the cranks, tangents, flag arms, indices, &c.—the mechanical parts of an ordinary meter. Then the prepayment valve and attachment are put into position. The attachment being fitted is the well-known "Sutherland-King" patent price-changing attachment, the particular merit of which is the worm price-changing gear which makes the work of altering the price of gas in slot meters so simple and easy to accomplish. The work of construction is now finished; and the meters are ready to pass into the hands of the testers and provers.

To those who are not conversant with the interior working of a meter, and even to those who do understand its mechanism, two of the exhibits will be of interest. These are meters with glass cases, so arranged that all working parts are under observation, showing each individual part doing its allotted work. A few minutes spent in watching these meters will convince the observer that, after all, a gas-meter is more than a tin box, and that it is a matter for wonder that it should go on working hour by hour and week by week for years with accuracy—receiving, as it often does, bad usage, and operating under adverse conditions.

There have been demands for some time for a meter with an automatic valve outside the case and easily accessible without the use of a soldering iron. The Sutherland Meter Company have applied for a patent for a meter which they are exhibiting and which supplies this demand. In this the slot attachment and valve are entirely outside the casing, the parts being screwed together; and the valve is contained in a chamber with a screwed cover which, when removed, enables any ordinary fitter to oil, repair, or replace, when desired, the automatic valve *in situ*. It is no longer necessary to remove the meter to the workshop.

Within the limits of the stand a comprehensive range of meters is shown, from a 200-light down to a particularly small slot meter

specially designed for use with hotel gas-fires. The display of meters includes the recently introduced standard capacity type as well as the "lights" type. In addition to meters, copper street lanterns fitted with high-power outside air and gas regulator burners are shown, also examples of clockwork automatic controllers for public lighting.

No. 72.—MESSRS. W. PARKINSON & CO.

Messrs. W. Parkinson & Co. (Incorporated in Parkinson and W. & B. Cowan, Ltd.) are showing a complete range of gas-meters of every description, including those of the wet and dry patterns, both for ordinary consumers and for those on the prepayment system. Their exhibit covers a great variety of types; and where, owing to questions of space, it is impossible to exhibit the actual article—as, for instance, in the case of large station meters—models of the different patterns are shown to illustrate the designs. The stand includes the new standard dry meters, also "Duplex" wet meters, made both in sheet metal and in cast-iron cases. The "Duplex" type possesses many special features and advantages.

Another section of the firm's display deals with the lighting of street and outdoor spaces generally. Here again, a very varied assortment is to be seen, including the most modern types of preheated inverted burners in square, circular, and hexagonal lamps. There is also a range of gas arc lamps on view; and a particular feature in all these patterns is the ease with which both gas and air can be adjusted from the outside while the lamp is alight.

At one end of the stand, by arrangement with the Executive Committee, the firm are showing a complete set of meter-testing apparatus, including test gasholders as supplied by them to most of the official testing stations throughout the country. This meter-testing apparatus is in action; meters being actually put on the bench and tested for soundness, registration, steadiness of lights, &c. It is believed this is the first time that the method of testing has been shown in this way at a public exhibition.

Another special feature of the exhibit is a great variety of pressure gauges; and these include the new single-tube gauges, which are readily adaptable for the indication of pressure, vacuum, or differential pressure. They also show vaporizers to overcome naphthalene difficulties, and a large variety of other apparatus, among which are station and other governors. One special exhibit is the "Beasley" recording gas calorimeter, which is now fitted with a new patent correcting device attached to the escapement meter. This corrector so controls the volume of gas delivered to the burner that the calorific record gives the results in British thermal units per cubic foot automatically corrected to normal temperature and pressure. This is the first time this instrument has been shown.

It may be noted that the firm were established as long ago as 1816; but from the foregoing remarks it will be realized that their manufactures are right up-to-date, and that they are exhibiting much novel apparatus.

No. 73.—MESSRS. E. A. WOOD.

At this stand, Graetzin high-pressure lamps, including 4000, 1500, 1000, 750, and 500 c.p. units for street lighting, and a range of Graetzin high-power low-pressure lamps for outdoor and interior lighting, are shown. Some of the high-pressure lamps are fitted with distance lighters for midnight service; and there is an entirely new Graetzin distance lighter for upright and inverted burners, applicable to workshop and factory lighting. Among other exhibits may be mentioned "Magna" midget lights, "Wood's" mantle rods, magnesia nozzles for upright and inverted burners, gas fittings and brackets, bead fringe and silk shades, and fancy and general glassware.

No. 74.—THE HURRY WATER HEATER COMPANY.

At this stand there is a range of "Hurry" bath water heaters, as well as some "Hurry" geysers, in bright copper and white porcelain finish. There are also portable gas-coppers, and restaurant water heaters, including a water boiler for the service of 300 teas an hour.

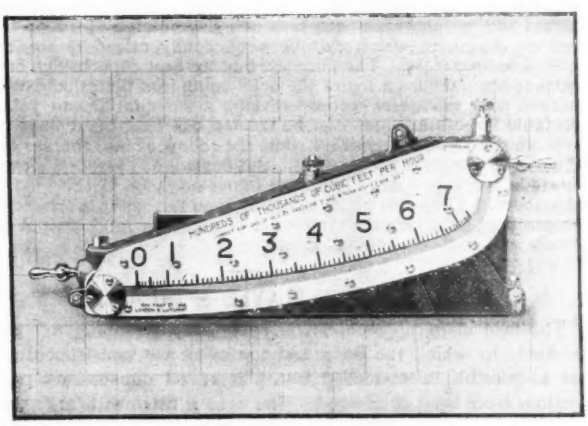
No. 75.—FORTH & CLYDE & SUNNYSIDE IRON CO., LTD.

A number of different pattern cookers are displayed on this stand. The "Gasecon" cooker possesses various special features. The design has been made as plain as possible. The boiling burners are of two types—the ordinary ring or the disc form—and they are arranged to interchange, so that either can be used at will. Endeavour has been made, as far as possible, to arrange the burners and grid bars of one size to interchange with all the other sizes, and thus avoid multiplicity of different burners and grid bars requiring to be stocked for maintenance purposes. This cooker can also be had on a cast-iron stand, enamelled white, and with a white enamelled panel in the oven door. The "Regulus" series of cookers, again, have features of their own. Perfect combustion of gas in the oven is obtained by controlling the admission of air necessary for proper combustion. It is pointed out that a direct result of this control is that a much higher oven temperature is reached without increasing the amount of gas used. A simple method of adjusting the height of the hotplate from the burners ensures efficient combustion at the boiling and grilling burners with gas of any composition or pressure. The design is very plain. The oven is fitted with a patent air opening, for admitting air to the oven, and with close-fitting drip tin, whereby the efficiency of the oven is greatly increased. The "Regulus" cooker is made in sizes for medium and small households, and in larger form for hotels, restaurants, or boarding houses. In some cases it is shown on a white enamelled stand. Other patterns are the "Brunswick," "Norman," "Saxon," and "Anglo-Swiss" cookers.

Hotplates, hot closets, and grillers are displayed, together with portable boilers; and the firm have a useful series of gas-fires—including the "Baronet," "Coronet," "Glamis," and "Cabinet"—fitted with a new patent burner and gas injector, making for efficiency and silent action.

Nos. 76 & 77.—MESSRS. GEORGE KENT LIMITED.

The stand of this firm is full of interest. In last week's "JOURNAL" two of the exhibits were described in some detail (see *ante*, p. 734). These were the expanding Pitot tube and the Kent coal meter, which are attracting great attention. Among their other exhibits, which include meters of the station and shunt types, is a curved-tube manometer, which has been developed in order to provide an accurate and easily-read air or gas rate-of-flow indicator for use in connection with a Venturi tube, Pitot tube, or orifice. One of the difficulties in producing an easily-read manometer is that the flow varies as the square-root of the pressure difference, thus giving a cramped scale at low flows. In the curved-tube manometer this difficulty has been overcome by curving the tube so as to obtain an equally-spaced scale from about 1/15th of the maximum flow upwards. It can be supplied to work at any of three different maximum heads—viz., 0·8 in., 2 in., and 4½ in. water gauge. Those designed to work at the maximum heads of 0·8 in. and 2 in. are more especially suitable for Pitot-tube work; while those for 4½ in. are suitable for orifices measuring high-pressure gas, or the air supplied to cupolas, &c.; the loss of pressure across the orifice in this latter case being only 2½ to 3 in., owing to the recovery of pressure which automatically takes place on the downstream side of the orifice. As will be seen from the illustration, the manometer scale is clear and easy to read; the meniscus of the liquid giving a definite line whose position on the scale can be read to 1/100th of an inch without difficulty. The manometer is designed so that there is no appreciable variation of the zero with changes of temperature. It is provided with an equalizing valve (so that the zero can be checked at any time) and with a displacer operated through a gland (by means of which the zero can be adjusted).

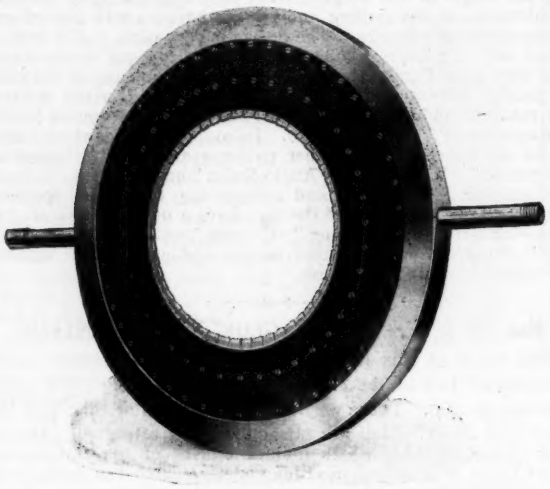


Curved Manometer Tube.

The material of which the gauge tubes are made is celluloid. This material is, however, unsuitable where ammonia gas, or gas containing much ammonia, is being measured. In such cases special manometers with glass gauge tubes are supplied. The standard manometers are not suitable for pressures of more than 5 lbs. per sq. in. Where the air or gas pressure is greater than this, special instruments are used.

It has been found, when measuring dirty gas, that the usual form of orifice successfully used for comparatively clean gas, compressed air, or steam, is not suitable, owing to deposit settling on the edge and faces of the orifice. This deposit alters the coefficient of discharge so as to cause the meter to read fast. To overcome this difficulty, a self-cleansing orifice has been designed, and in practical working has proved satisfactory. The cleansing liquid must be injected under a pressure about 5 lbs. per sq. in. higher than that of the gas in the main. This pressure can be obtained by storing the liquid in a tank, or by half-filling a

chamber into which compressed air can be pumped. Ammoniacal liquor is most suitable for cleansing tarry deposits such as occur in mains coming from retort-houses, water for removing siliceous deposits such as occur when measuring water gas, and solvene for



Self-Cleansing Orifice.

removing the naphthalene which may deposit when measuring ordinary town gas. The cleansing liquid must be free from particles of dirt or from lumps of tar, as the nozzles are only one millimetre wide.

No. 78.—A. D. WIMBUSH & SON.

This confectionery firm show two gas-heated baking ovens—one by Messrs. Russell & Co., of Birmingham, and the other by Messrs. C. Portway & Son, of Halstead—in connection with which there are baking demonstrations. Messrs. Portway & Son (whose ovens possess the great advantages of extreme simplicity combined with remarkable compactness and economy in running expenses) have another oven on view in connection with the City of Birmingham Gas Department's stands.

Messrs. Russell & Co., bakery engineers, of Birmingham, have designed and erected a special oven heated by town gas, which will be in operation on this stand during the exhibition, baking all classes of bread and confectionery for Messrs. Wimbush & Son, who are the Official Exhibition Caterers. The oven is a double decker—each baking chamber being 5 ft. by 5 ft.—and is constructed on Messrs. Russell's well-known system of combined steam and hot-air tubes; the heat being circulated all round the baking chambers, which can be very rapidly raised to any required temperature. The flues are built of best Stourbridge firebricks; the outside casing of the oven being iron plates, and well packed with silicate of cotton—making a substantial and yet a portable structure, which can be erected on the ground floor or any other floor. The makers claim the following advantages for the oven: Continuity, uniformity, and control of heat, and cleanliness in working—there being no fumes or gases in the baking chambers. They also claim that this oven is a good commercial proposition, being constructed on a scale for a large output of goods, and being economical in use.

No. 79.—SIDNEY FLAVEL & CO., LTD.

The firm make an extensive display of "Leamington" gas cookers, in which the body and the oven are constructed as far as possible in enamelled iron plates; all unnecessary projections have been eliminated. The oven is fitted with an automatic device which closes the oven flue when the oven burners are extinguished. The "Flavel" burner fitted to the hotplates is constructed on improved principles, and designed to effect a substantial saving in gas consumption. The burner is silent in lighting and extinguishing. It can be regulated to secure the required proportions of gas and air to attain the highest efficiency under all conditions. The "Leamington" table gas kitchener in rustless steel will be generally admired.

In the series of "Leamington" gas-fires are to be found all the popular types for general use, as well as gas-grates and gas-mantel registers. The firm's gas-stoves in rustless steel are suitable for all forms of refined decoration.

No. 80.—THOMAS GLOVER & CO., LTD.

The following outlines some of the exhibits of this firm: A prepayment meter with glass case, which reveals the working of the mechanism; a section of a prepayment meter, showing details of how the movement is operated by the insertion of the coin; the last ordinary meter made by the Company prior to the opening of the Exhibition; the 1851 prize meter (awarded a gold medal when exhibited at the Hyde Park Exhibition in 1851), the first dry gas-meter used by a gas company (this was manufactured by Thomas Glover & Co. in 1844, and was sold to the Coventry Gas-Works; after being in use for 52 years it was taken down, overhauled, and stamped as correct by the Official Stamping

A "Flashomotor" Effect.

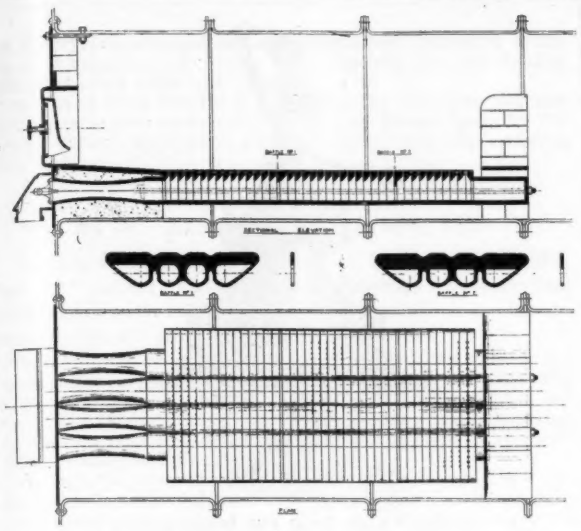
Office); the first prepayment meter manufactured by the firm; a model showing the working of the meter mechanism; and the last prepayment meter made by the Company prior to the opening of the exhibition. The "Gothic" street lantern, constructed of copper, fitted with superheated burner and provided with hinged top for cleaning purposes, is also shown. There is an interesting machine for testing the durability of incandescent mantles. The mantle tester is operated entirely by water pressure, and can be connected to any convenient source of water supply.

Automatic devices include the "Gas Flashomotor" (Ramsay-Jackson's Patents), which is an efficient and reliable flash-sign operated entirely by ordinary gas pressure; the "Lighthouse" flash sign, which flashes six different messages from any particular point of view, is self-contained, and needs only connecting to the gas supply; and the "Wall" flash sign, which displays the badge of the Company.

No. 81.—THE CHEMICAL ENGINEERING AND WILTON'S PATENT FURNACE CO., LTD.

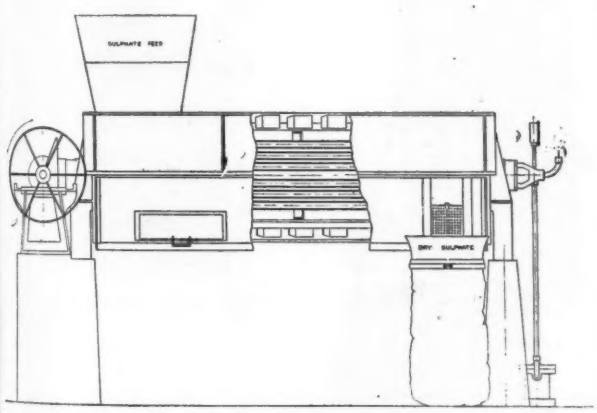
Many new features are embodied in the exhibits of this firm; and a short description of these will be of interest. The neutral sulphate of ammonia drier consists of a circular body and a revolving horizontal shaft with lifters which shower the sulphate over steam-heated pipes, thereby converting the salt to a sand-like substance, which is discharged in batches through a suitable gauze, thus avoiding lumps. This machine does not grind the sulphate or produce any dust, but allows the salt to remain in dry crystalline form. A number of samples of sulphate of ammonia are exhibited, to show the quality produced at various works. The bagging of the sulphate is rendered automatic. An automatic weighing machine is shown, through which it passes, and which weighs it automatically in the bags. It is fitted either at the outlet of the drier or under a feed hopper into which the sulphate is conveyed.

The Wilton's patent sight-feed indicator shows the feed of ammonia liquor to the still under pressure. This is also applicable to the flow of water or benzole, or any other liquid where the rate of flow may be observed. A model of Wilton's complete plant for dehydrating tar, which has been fitted at a great many works during the past fifteen years, elucidates their method of treating tar, and demonstrates the safety in working this plant with unskilled labour. The model also shows the extension of this plant for complete distillation to pitch. The Wilton's patent forced-draught furnace, with its many improvements, will be of more than passing interest to all gas engineers. For burning coke breeze and other low-grade fuels for steam-raising purposes, this furnace has enjoyed an enviable position for the past thirty years. Many will remember the original design, with its attendant



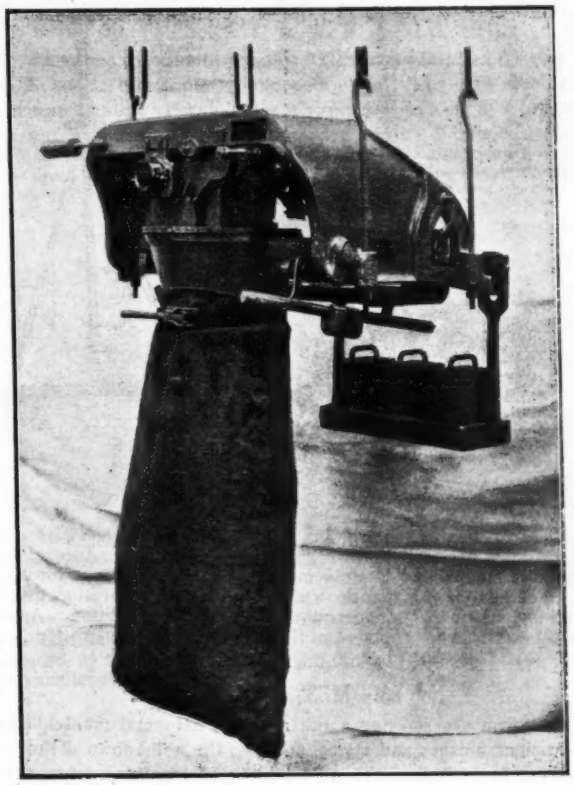
Wilton's Patent Forced-Draught Furnace (1920 Pattern) fitted to Boiler Flue.

faults; but the new improved type on exhibition, embodying as it does the experience gained over thirty years, can claim to have overcome all difficulties. An even draught over the whole grate area is guaranteed, while the old difficulty of burnt-out fire-bars has been overcome by a more robust design of bar; plenty of metal being left in contact with the fire, and a greater area on each bar being effected, thus doing away with the greatest bugbear—cost of maintenance. A flue-gas analysis of 16 to 18 p.ct. CO_2 is obtainable with these grates. Again, increased heating surface is obtained at the spot most desired, thereby greatly increasing the steaming capacity of the boiler. By the disposition of the grate in the flue, the crown of the furnace is saved from injury.



Wilton's Neutral Sulphate of Ammonia Drier.

An open saturator for making one ton of sulphate per day is demonstrated. A special feature of this is the manhole for inspection and repairs, which can be opened without disturbing any of the pipe connections. An acid-spray catch box is bolted on; and the ammonia and acid pipes are detachable, so that replacements can be made without lead burners. Another exhibit comprises a draining table for draining sulphate fished from saturators; the novel feature being the draining tiles, which assist the draining pipe and natural suction, and have replaced the boards formerly used. A change valve for operating the oxide purifiers of the sulphate plant is shown. There is nothing new in this, except the increased depth now required by the Alkali Inspector. There is a small ammonia still section and a model of a large ammonia still showing how the contact between the ammonia and steam has been improved. In this, the flow of liquor prevents any lime deposit. A patent discharger for sulphate of ammonia saturators and a monitor case are exhibited. The latter shows a new wooden top, which is lighter and easier to handle, and is in two pieces for dismantling the centrifugal basket. In the new model of their centrifugal basket the shape has been altered to give extra strength and added capacity without increasing the size of the machine. This has been done by dishing the top and bottom covers. The new type fits all the existing machines. Wilton's automatic lime pump, which delivers a constant feed of boiling milk of lime to the still, and which has no ram, and therefore is not subject to the usual wear and tear on ram pumps, is another item of consequence. The spent-liquor valve has not been altered for some few years. It

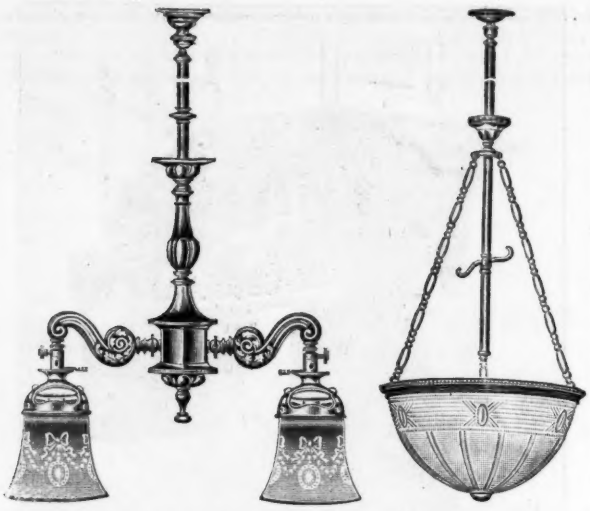


Wilton's Bagging and Weighing Machine.

is used for releasing spent liquor from the still without loss of steam. A pressure box is attached to all Wilton's plants, and acts as a safety valve on the ammonia still. It indicates the working pressure, and in the event of blockage it releases the excessive pressure automatically. On closing down it relieves the vacuum.

No. 82.—THE NEW INVERTED INCANDESCENT GAS LAMP CO., LTD.

A wide range of new and artistic gas-fittings, including brackets pendants, table standards, and dish lights, is displayed. Particular prominence is given to the latter, which are fitted complete with pneumatic distance switches. This firm also exhibit



ranges of silk and bead shades, lantern globes, and glassware, and their latest patterns of "Nico" burners. Another feature of interest is the "Nico" flexible mantle. The makers put forward high claims for this mantle, which is shock and vibration proof, and is consequently eminently suitable for street lighting. A few of the exhibits are depicted in the accompanying illustration.

No. 83.—MESSRS. F. TURNER.

This firm are showing a full range of art-metal mantelpieces in various finishes and styles, and also the well-known art-metal surrounds, including the adjustable pattern which is used in large and increasing numbers by leading gas undertakings. This surround was particularly designed for covering-in old-fashioned firegrates; and the special feature is its adjustability, by means of which it can be arranged to fit mantel openings of various sizes. An unsightly fireplace is quickly changed to an up-to-date and artistic setting for a gas-fire; and the cost of the surround is very moderate. Canopy surrounds of various types are demonstrated. This style of surround is used in conjunction with grate fires similar to the "Sunbeam," &c., and is made to suit any size of fire or mantel opening. Small art-metal mantelpieces for housing schemes, &c., hearth plates, raised hearths, curbs, &c., to match surrounds and mantels, are also shown, with gas fittings and burners, and general art-metal work.

No. 84.—MESSRS. MOBBERLEY & PERRY, LTD.

The exhibits of this firm include model gas-retorts, segmental retorts, sight boxes and plugs, air-port tiles, reveal and main-arch bricks and blocks, air channels, retort stays, boiler blocks and flue covers, retort springers, tank blocks, roofing tiles, and an assortment of specials for carburetted water-gas plants and vertical retorts. The fireclay goods are all manufactured from their own seams of "Old Stourbridge Fireclay," and there are to be seen samples of raw old clay as raised from their mines.

No. 85.—H. W. BAINBRIDGE & CO., LTD.

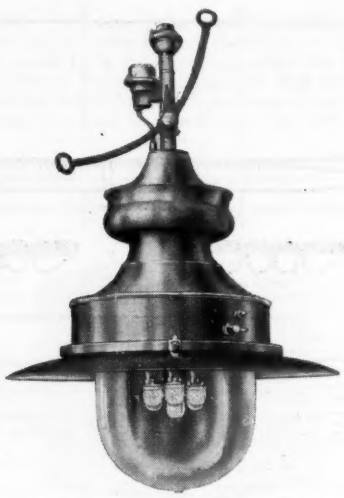
The firm specialize in hot brass and bronze stampings for gas and water fittings.

No. 86.—THE MIDLAND GAS AND WATER FITTINGS COMPANY.

With regard to the "Midland" solid plug main cock, the Company point out that the introduction of a solid plug has made practicable a perfectly parallel bore from inlet to outlet. This, and the fact that it is absolutely smooth, reduces corrosion to a minimum. They are also showing solid-drawn fittings, and water-heating apparatus with a very small consumption of gas.

No. 87.—MESSRS. WILLIAM SUGG & CO., LTD.

At this stand are exhibits of many fine lamps and burners, for which this old-established firm are famous, and also some specimens of their gas cookers, geysers, and boilers. Included among the exhibits are the following: The "Littleton" lamp, for outside lighting, with multiple small mantles on a single superheater, and fitted with distant-control device; the "7176" lamp, which is constructed on the same principles as the "Littleton," but designed for inside shop and office lighting; the "Surbiton" lamp, also designed upon the same principle, but with the casing in polished aluminium, and fitted with silica globe; the "Carshalton" pendant, which has a dignified appearance, and is particularly



The "Littleton" Lamp fitted with Distant-Control Device.

suitable for church lighting; and the "Osborne"—an excellent pendant for the home. In connection with semi-indirect lighting, the "Bon Marché" fitting is shown. This is especially adapted for lofty positions, or where there is no white ceiling to

The "Osborne" Pendant.

The "Imperial" Burner.

give reflection. Another item of interest is a garage lamp, which is perfectly safe; the ventilation openings being protected by Davy gauze.

A novel and most attractive series of "Elite" burners in polished aluminium is shown. Other burners of note are: The "Exeter" pattern, which is designed to replace upright burners in places of worship, &c.; the "Dolphin" (a similar fitting, suitable for public houses); and the "Imperial" series of fittings (also in polished aluminium) for domestic lighting. The "Windsor" street lamp is exhibited unpainted, in order to demonstrate the workmanship; and several forms of distant-control devices are shown. In addition to specimens of school fittings, the firm show their No. 1357 conversion fitting for existing street lamps. Thousands of these are now in use all over the country, and are giving much more illumination, and at less cost, than the burners displaced by them. There are many specimens of gas-cookers, among which may be mentioned the "Vincent," which enables cooking to be performed without stooping.

On this stand is something quite new in the line of gas-heated boilers—a boiler having the interior pan and top rim in one piece of porcelain-enamelled cast iron, making it impossible for water to leak back into the casing or the products of combustion to mix with the contents of the pan. Their geysers are noteworthy for strong construction and high efficiency.

Not only at Stand No. 87, but in avenues, the conference room, on various other exhibitors' stands, and in streets outside the exhibition, will be found examples of the firm's lamps, fittings, &c.,

for all purposes, arranged on their superheated system of multiple small mantles—the system which secures the last lighting unit out of every cubic foot of gas.

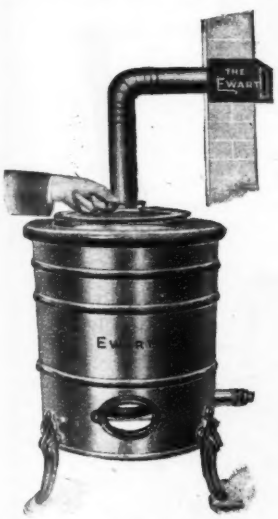
An item of much interest is to be found in the historical section, where various models of burners and fittings made by the firm are shown—applying to periods of thirty, forty, fifty, and even sixty years ago.

No. 88.—MESSRS. EWART & SON, LTD.

This firm are exhibiting, in various sizes and heating capacities, their "B" pattern "Califont," which furnishes an independent supply of hot water instantly, wherever required. It is a labour-saving device, and most economical. It may be fitted in any part of the house, and provides an unlimited supply of hot water to any number of taps. The hot water, the temperature of which may be regulated at will, continues to run as long as the tap is left open. The closing of the hot water draw-off tap instantly lowers the gas to a pilot light. Consequently the gas only burns fully while the water is actually running.

For bath purposes the firm recommend the "Lightning" geyser, which is exhibited fixed over one of their improved cast-iron porcelain-enamelled baths. Inexpensive bath heaters of the geyser type are seen in the "Royal" and the "Victor" patterns; and in the "Victor" shower geyser an example is shown of a low-priced useful contrivance.

In cafés and hotels there is an increasing demand for a satisfactory boiler which will give rapid supplies of boiling water—freshly boiled—for tea and coffee making. An example of their "Ever Ready" boiler is exhibited. The merit of this boiler is that the water is boiled as required—*i.e.*, cold water enters the



The "Boilo" Gas Copper.

The "Califont" Water Heater.

apparatus and boiling water leaves it. The water is therefore always fresh. The "Boilo" gas-copper is attracting a good deal of attention among gas engineers, owing to the fact that the copper pan is made from one piece of metal, without seam or joint. All parts are standardized and may be readily refitted when worn. With the introduction of gas heating, difficulty is often experienced in heating the linen cupboard where previously a hot-water cylinder in connection with the kitchen boiler was usually employed. Messrs. Ewart have introduced a convenient method of meeting this difficulty. This is their linen-cupboard heater, an example of which is shown on their stand, and for which they have had many inquiries. The consumption of gas is small, and the results are highly satisfactory.

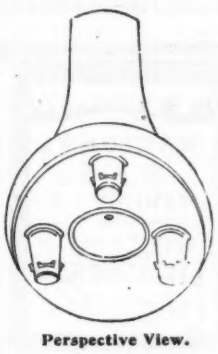
Ewart's improved gas-heated towel rail meets a long-felt want, for in few bathrooms is there any adequate means of warming the room and drying the towels. The "Euston" towel rail meets both requirements at a nominal cost of gas, and may be easily fitted, requiring attachment only to a small gas-pipe. It rapidly develops a comfortable heat in the room. It is felt that there would be a large demand for this reliable towel heater if it is known how easily it can be fitted and how effective it is in use.

No. 89.—MESSRS. A. G. SUTHERLAND, LTD.

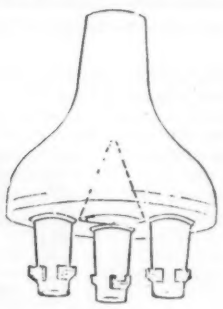
This firm are showing gas-meters, prepayment and ordinary, in various styles and finishes, component parts, pressings and stampings in various metals. Demonstration glass-cased prepayment and ordinary meters are shown working; and it will be remarked that these are very fine specimens. There are also diaphragms mounted in pans, showing the method of fixing the leather. All the meters made by the firm are of the dry type.

No. 90.—MESSRS. J. & W. B. SMITH, LTD.

This firm are showing their latest "Glasmi" patent all-fireclay mantle nozzle in two pieces, and new 3-light and 5-light all-clay superheater boxes. Formerly the clay nozzle was fixed to a brass tube, and there was the difficulty caused by the different coefficients of expansion of the two materials. This has been overcome in an effective manner; and the accompanying illustrations show clearly how this has been done.

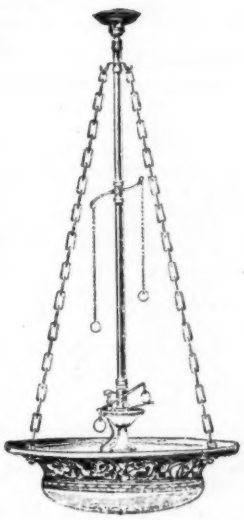


Perspective View.



Front View.

They also have on view a well-designed semi-direct pendant, with decorated bowl. In this the knitting pin of the tap has been replaced by a washer. An illustration of this pendant indicates the excellence of its design.



Decorated bowl fittings, "Corona" silk shades, artistic patterns of real Venetian bead shades, up-to-date patterns of hall lanterns, and brackets and glassware in various finishes combine to make a first-class exhibit.

No. 91.—JOSEPH BREEDEN & CO., LTD.

Inverted incandescent lamps for interior and exterior lighting, together with indirect lighting fittings, burners for intensive lighting, small gas-fittings, &c., are displayed in attractive form on this stand.

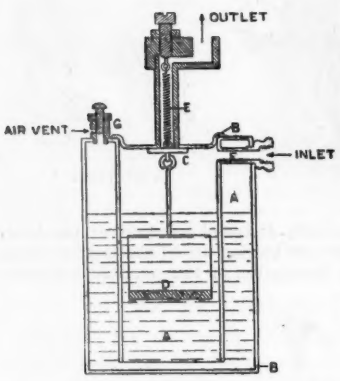
No. 92.—BURNERS (1921) LIMITED.

This exhibit comprises a full range of "Efficient" lamps, burners, and pendants, incorporating the new screw-collar air adjuster, gas regulator with multi-hole detachable cleaning nipple, and armoured actuating discs to prevent the fibre wheel burning or breaking. An entirely new departure is on view in the "Efficient Silent" burner, which, though without air adjustment, is silent and efficient on any grade of gas. This burner is revolutionary in its construction, and marks a big change in design. All the goods on the stand are in the new "Nickel Alloy" finish, which is a step towards the non-tarnishable burner.

Everything shown (with the exception of glassware, porcelains, and steatite nozzles) is manufactured at the Stoke Prior Works of the Company; and as the exceptions are all made in England, every exhibit is absolutely British-made, thus proving that it is still possible to buy 100 p.ct. British-made lighting goods which for quality, distinctiveness of design, and strength of construction are excellent.

No. 93.—WALKER AUTOMATIC GAS SIGNS.

At this stand the attention of gas engineers and salesmen is drawn to a simple automatic gas flasher exhibited by this firm. The device consists of a controller through which the gas is passed before reaching the sign to be illuminated. It will operate a single incandescent light or a number, and may be situated at a considerable distance from the sign. For example, the signs may be outside a building, and the controller inside. It is made of materials that do not rust or corrode, and its appearance is attractive. From the following illustration and detailed description, the reader will be able to visualize the mechanism, and obtain a clear idea of the working, of the controller.



Showing Working Parts.

As in Use at the Exhibition.

The flasher consists of two cylindrical chambers (an inner and an outer) A, containing a liquid which is allowed to pass from one to the other through an opening at the bottom of the inner chamber. Top and bottom plates seal the chambers. The gas outlet in the top plate is controlled by a valve C, to which is attached a weighted float D. A tension spring E supports the valve and weighted float. F is the gas inlet, opening into the top of the inner chamber; and G an air vent, to admit atmospheric pressure, and to control same.

The gas being turned on, the valve is closed by the liquid lifting the float, the tension of the supporting spring, and the gas pressure within the inner chamber. The gas pressure, however, forces the liquid from the inner to the outer chamber, until a point is reached where it no longer supports the float. Then the weight overcomes the tension of the spring and the internal gas pressure, the float drops, opens the valve, and releases the gas to the burners. This relieves the internal gas pressure, and the atmospheric pressure entering through the air vent forces the liquid in the outer chamber back into the inner one until it again lifts the float and closes the valve, when the same action automatically occurs. The duration of the light and dark intervals can be timed by adjusting the screw of the air vent.

An important feature of the flasher lies in the fact that the gas flow to the burner is adjusted instantaneously—a point which gas salesmen will note with satisfaction. It can be fitted to existing signs without necessitating alteration of them. Apart from technical details, the economic factor should not be lost sight of, for this invariably is a potent argument; and the saving in gas consumption effected by the use of an intermittent sign will probably be the deciding element in the successful outcome of many suggested installations.

No. 94.—EXHIBITORS' AND ENGINEERS' CLUB.

No. 95.—MESSRS. CHARLES F. STEAD & CO., LIMITED.

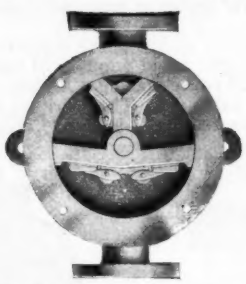
The claim that "there is nothing like leather" is made at the stand of this firm. The splendid display of meter diaphragm leathers, and in particular their special "chrome tanned meter persians," is very convincing of the sound workmanship of the firm. There is also on view a demonstration meter, showing the importance of leather, and maintaining their statement that "the leather is the heart of the meter." Gas engineers should certainly visit this stand. Messrs. Stead & Co. have been producers of meter leathers for over sixty years, and have brought to bear on their present products the information gained by this long experience.

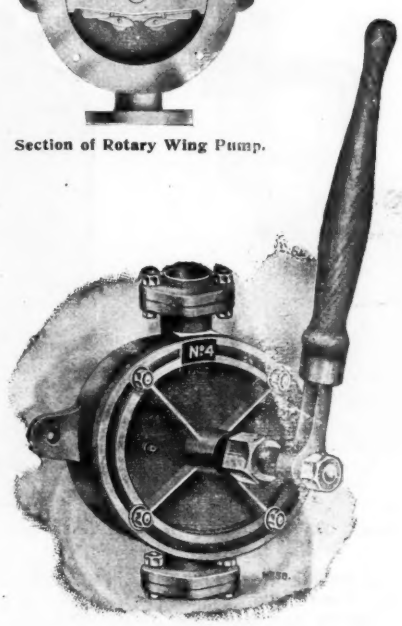
No. 96.—JACKSON BOILERS, LTD.

An interesting exhibit is made by this firm of boilers for cafés, &c., delivering a constant supply of hot water. The "Jackson" apparatus is said to deliver boiling water within four minutes of first lighting the gas, and continues to do so as long as the gas remains on. The boilers are of various types and sizes, for use in soft or hard water districts, and suitable for the smallest coffee house or the largest still room.

No. 97.—MESSRS. ABBOTT, BIRKS, & CO.

The stand of this firm contains too many exhibits to outline separately, but mention may be made of one or two. A double acting semi-rotary wing pump is demonstrated, for example, which is operated by working a handle to and fro. This action is preferable to the up and down motion of the plunger or other types of hand pump, as it is less fatiguing, and water is delivered both on the forward and backward strokes. The suction valves are fitted in the lower part of the body, immediately over the suction pipe; and the delivery valves are located on the reciprocating impeller, or wing, inside the body. They can be inspected by simply removing the cover. The accompanying illustrations give a good idea of the pump, which acts both as a lift and force pump. With the use of a foot valve it will lift 25 ft. vertically. The height of delivery may reach 70 ft.


Section of Rotary Wing Pump.

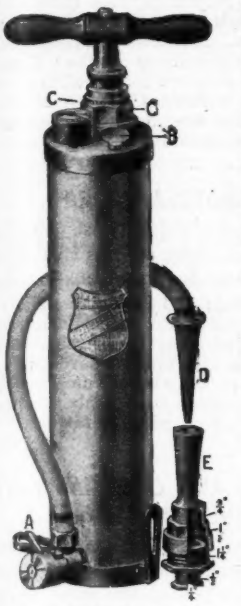


Rotary Wing Pump

A main thermometer shown in the illustration attracts considerable notice. This consists of a tube which is screwed into the main, close against which the dial lies when fixed; the reading always being in sight. Several high-pressure service cleansers are exhibited. The photograph depicts one fitted with

Main Thermometer.

a quadruple-acting pump which attains a pressure of 300 lbs. per sq. in. This has been designed after many years' experience, every ounce of weight serving some useful purpose. This pump has three leathers only, all of which are strong and durable, and can be readily renewed. It also has an instantaneous discharge cock, thereby giving the maximum clearing action. Something entirely new is shown in the "Abbirko" force spray pump, suction, and compression cleanser. This is an excellent device for spraying solvent into fittings, street lamps, &c. It will clear small stoppages by suction; and if this action is insufficient, by the simple turn of a tap, it can be converted into a compression pump, when the stoppage may be removed by pressure.



High-Pressure Service Cleanser.

Regarding the cleanser pumps, the firm write as follows: "Owing to the growing cost and inconvenience of renewing services due to road improvements, it is becoming increasingly important that stoppages be cleared without recourse to the opening-up of thoroughfares. It is now a generally accepted fact that it is preferable that the substance forming a stoppage in a service should be drawn out, if possible, instead of being blown back into the main. Unfortunately, suction is limited to about 14·7 lbs. per sq. in. (atmospheric pressure), which, in many cases, is insufficient to withdraw an obstinate obstruction. If, however, in such cases a small pressure charge is released into the service to loosen the obstruction, the chances of failure by a repetition of suction are minimized. Should both the above fail, then recourse must be had to blowing the obstruction back into the main by means of suddenly releasing a large pressure into the service; thus giving maximum inertia to a volume of air. With this end in view, the firm have designed a 'Dual Purpose Pump,' which very ingeniously can be changed over from a pump creating vacuum to that creating pressure up to 300 lbs. per sq. in. by the simple turn of a tap; the working stroke in each case being downwards. An extra tank (a light one) is, of course, necessary when on suction, in order to give sufficient volume to draw the stoppage clear of the service. A small pump on the above lines is also made for cleaning small obstructions in internal fittings. The Pressure Service Cleanser Pumps, Nos. 34 and 35, are almost too well-known to need a description. The pump is compound—*i.e.*, compresses the air in stages, thus enabling a large pressure (300 lbs. per sq. in. if necessary) being attained in the shortest time. The weight is only 11 lbs., and the size about 14 in. by 4 in.; thus the cleaning of the service is a one-man job. The automatic instantaneous piston release cock causes the air to clear the service by inertia—*i.e.*, weight and velocity—not pressure, as is so often imagined. The pressure itself becomes almost negligible after release into the service. The pump is exceedingly simple, having only three leathers."

Two interesting leakage testers are also shown, both for internal fittings. One of these is of the dry-gauge type; the other is fitted with a bubble indicator—each being highly sensitive. Concerning leak testing apparatus, the firm say: "Whether internal fittings are installed by an outside source or by the gas undertaking, it should be the duty of the latter to test the fittings for leakage, and insist on any leakage being stopped before connecting-up to the meter. A small reliable and instantaneous leak tester has long been wanted. We have designed and made a leak tester, which weighs only about 3 lbs., and screws on to an ordinary gas-bracket. A few strokes of our force spray pump, the turn of two taps, and any leakage in the whole system as small as 1 c.ft. in 200 hours is immediately discernible by means of the well-known principle of air bubbles through water in a glass bell. Should a leakage be noticed, ether can be sprayed through the fittings by the same pump, when the source of the leakage can be quickly detected by smell. We have also designed a pocket leak tester on the pressure-gauge principle. Leakage is shown after a few strokes of the pump by loss of pressure indicated on a sensitive gauge. The leak, of course, is not shown instantly."

The firm are also showing gauges, instruments, tools, split collars, acid proof buckets, thermometers, shovels, forks, pumps, &c.

No. 98.—FREDK. MOUNTFORD (BIRMINGHAM), LTD.

This firm (who have a quarter-of-a-century's experience behind them) are exhibiting a complete range of stores for gas-works—such as charging shovels, coke barrows, flexible tubing, retort bolts, screwing dies, lubricating oils, stokers' mittens, asbestos goods. A special feature is the "Fremo" ratchet die stock, for gasfitters' use when working in confined spaces. They have also assortments of gasfitters' tools, tube vices, pliers, and so on. Other items are the "Fremo" high-pressure jointing, and joints for ascension, pipes, asbestos washers, india-rubber goods, &c.

No. 99.—MESSRS. ALEXANDER WRIGHT & CO., LTD.

Since 1913 this Company have had no opportunity of making an exhibit of testing apparatus; and this, coupled with the fact that in the eventful ten years which have elapsed no department of the gas industry has experienced such vital changes as gas testing, lends a particular interest to the apparatus displayed on their stand.

Their name has always been associated with photometers—at all events during the past eighty years; and the fine specimen of light-testing apparatus shows that they have not taken a back place as photometer makers. The exhibit is a 3 in. steel twin bar optical bench, ebonized, and with incised scales. Its equipment includes the Harcourt 10-candle lamp, which is still, and apparently always will be, the accepted standard of light, the Lummer Brodhun photometer, the Simmance-Abady flicker photometer, the Bunsen Rudolf disc, the electric light standards (with the equipment necessary for calibrating them against the Harcourt primary standard), &c. Street photometry is well represented; and it is clear that the field for it is now practically universal, street illumination having become so much more regularized. Interest will be evoked by the modern forms of gas analysis apparatus, as there are many prominent engineers who consider that only a complete analysis of gas can be relied upon for a judgment of its qualities. The testing for carbon monoxide, which has always been such a lengthy and troublesome operation, has now been simplified; and a recorder which registers upon a chart its percentage in the gas is shown, both in combination with a carbon-dioxide recorder, and also separately.

Pressure and vacuum indicators and recorders, of old and new design, are here; and apparently the demand has increased for instruments of this kind, which are extremely fine and sensitive in their reading, from the fourth part of a millimetre upwards. We do not observe that Alexander Wright & Co., Ltd., have yet gone over entirely to the side of those who advocate the metric system. Wherever metric indications are given, they are accompanied by the more familiar terms. Attention is specially called to a new apparatus designed by Sinclair and Taylor for the indication of pressures from a distance; and the simplicity of this, compared with the elaborate arrangements used in America and elsewhere, will be a revelation to English engineers. The liquid sampler which is shown, and which automatically collects individual small samples from a continuous running liquid stream for analysis and examination, is an extremely ingenious device; and though it has hitherto only been used by large oil companies, it should surely be found useful in the chemical work of gas undertakings.

Calorimeters are shown as a complete series, recording and indicating; and the changes and developments in this line are worthy of the closest attention. The recording specific gravity instrument (shown working) will call to the observer's mind the opinion expressed many years ago—that no testing of calorific power could be of much service unless accompanied by a test of specific gravity, the latter betraying at once the cause of any irregularities in the former.

It is impossible to mention all the different instruments shown. There are thermometers, recording and non-recording pyrometers, street-lighting flash torches, test clocks and governors, U-gauges, &c. We must, however, give a line to the "Yorke" weir water-meter. This is the apparatus with the peculiarly shaped weir, which enables the liquid flowing through it to be measured in regular proportions—that is to say, an inch of water flowing over the sill is exactly half the volume indicated by a flow of 2 in. and so on up to 6 in. A float upon the surface of the liquid thus gives a direct indication of the volume in thousands of gallons; and these amounts are recorded upon a chart, and also added up by an integrating index.

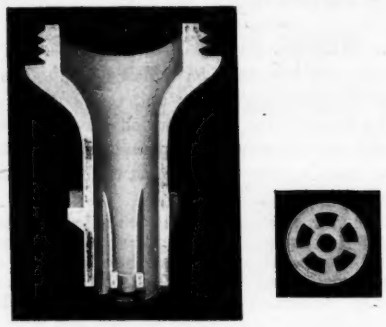
No. 100.—MESSRS. JAMES STOTT & CO.

A wide range of exhibits is to be seen at this stand. There is a patent fool-proof gas-heated water boiler for supplying boiling water in large quantities for hotels, restaurants, cafés, schools, public institutions, &c. Another display which attracts attention is the "Stott 1923" café or still-room set, comprising a Stott boiler, coffee-making machines, and self-regulating duplex milk and coffee urns. Among other exhibits are a gas-heated glue cabinet fitted with automatic control, a tea-making plant for use in canteens, &c., a mercurial gas-regulator, several high-pressure gas governors for regulating down from 30 in. to 5·10ths, and a self-regulating gas-heated ham cooker or food steamer. All the exhibits are shown working.

No. 101.—MESSRS. M. HOWLETT & CO., LTD.

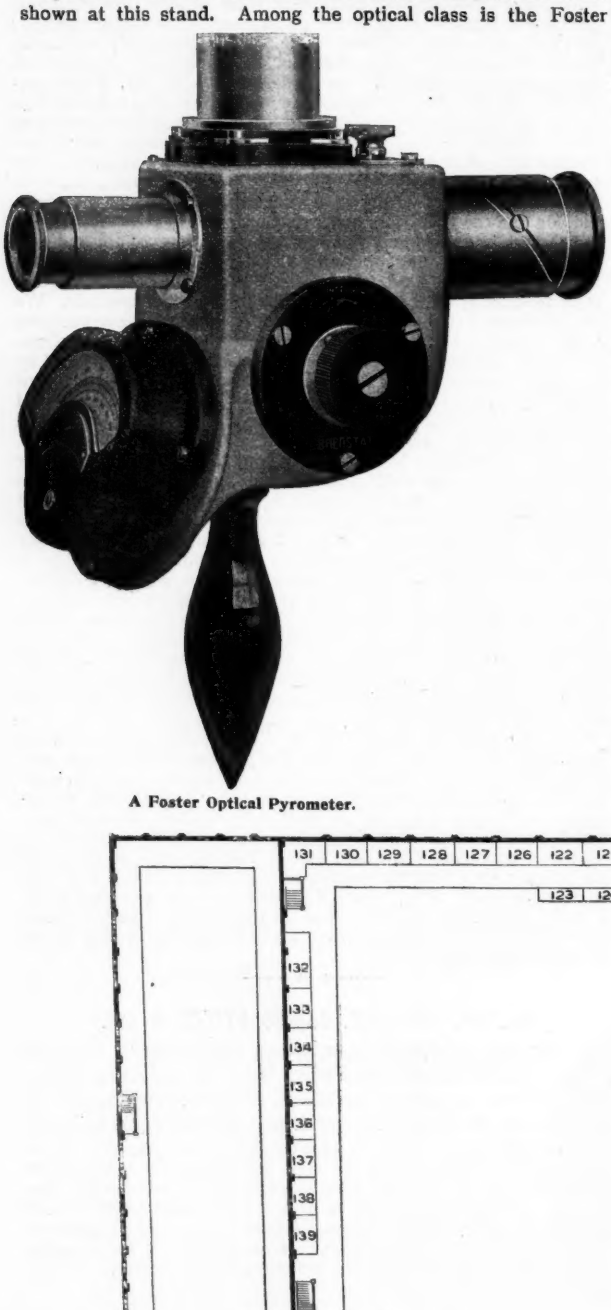
A showcase containing every description of magnesia-clay nozzles, by-pass taps, rings, mantle rods, perforated discs, &c., manufactured by Messrs. M. Howlett & Co., Ltd., is of great in-

terest. The firm make a special feature of their patent gauzeless nozzle, made in three sizes (Nos. 1, 2, and 3 fittings), used for pre-heated burners. An illustration of this is shown below.



No. 102.—THE FOSTER INSTRUMENT COMPANY.

Pyrometers for all industrial and research measurements are shown at this stand. Among the optical class is the Foster



A Foster Optical Pyrometer.

patent "lamp-bridge" unit system disappearing-filament type, which is extremely simple, portable, and robust. The "Fixed Focus" radiation pyrometer requires no focussing or other adjustment in use. It is a simple reliable workshop tool for high temperatures. The thermo-couple section includes those of the "base metal" construction, Hoskin's chromel-alumel wires, and also "rare metal" platinum alloys. All these are combined in simple robust forms. Of considerable interest are the "Resilia" indicators and recorders; a special patented construction providing industrial robustness with high sensitivity, and avoiding suspensions or other complications. The accompanying illustration shows one of the optical pyrometers exhibited.

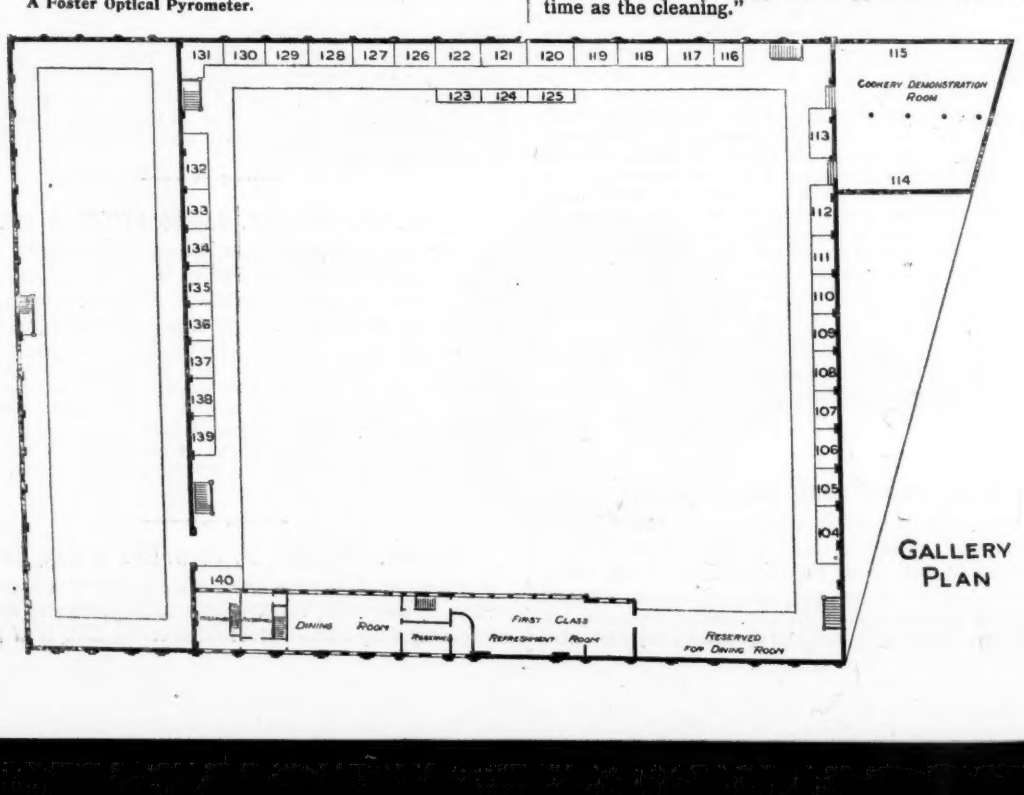
No. 103.—MESSRS. MABBOTT & CO., LTD.

This firm are exhibiting one of their first-quality fish and potato frying ranges fitted with special intensifying burners made by the Davis Furnace Company, Ltd. This is of the sunk-pan type, which eliminates most of the cleaning; and the makers claim to have solved the difficulty of smell and steam, which in the past have caused much unhappiness to the occupants of neighbouring houses. The ranges are constructed on principles developed and proved by the experience of many years to be the most suitable for the trade. Gas used in this connection is certainly an attractive proposition from the point of view of gas undertakings.

No. 104.—BRITISH, FOREIGN, AND COLONIAL AUTOMATIC LIGHT CONTROLLING COMPANY, LTD.

The following description of the "Gunfire" (Gunning's patent) controller is from a report made in 1904. The apparatus has been greatly improved since that date; but the exhibits show the controllers as used then, and others dating back as far as 1897, as well as the latest models.

"Gunning's apparatus for automatically lighting and extinguishing street-lamps is applied to each lamp individually. The apparatus comprises a clockwork mechanism contained in a case, and a slotted disc. Pawls are fitted into the slotted disc in such a manner that they can be placed to turn the light on and extinguish at the actual times required daily; and this operation is performed for one week with one winding. The mechanism is of small dimensions, is contained in a small brass case, and when in use is fixed to the standpipe inside the lantern; the burner being screwed to the tap of the mechanism. It is therefore ready for use with all present lamps, fittings, and burners without alteration. The apparatus is supplied in four patterns: (1) For use with single burners or for clusters where all the lights are to be turned on and off together. (2) For clusters where part of the burners are to be reduced about midnight and the remainder at dawn. (3) For burners to light at dusk, extinguish about midnight, and re-light for an hour-and-a-half in the early morning. The attachment for re-lighting can be removed during the summer months. (4) A quick movement apparatus for 'S.I.' and high-pressure burners. Each apparatus is supplied, complete with by-pass, ready for use with the burner for which it is required. The method of working adopted by authorities who have large installations is for 1000 lamps to be worked by four men, who do the whole work of cleaning lamps, renewal of mantles, and winding the apparatus to the section of 1000 once weekly. The winding and setting of the apparatus are done at the same time as the cleaning."



Nos. 105-6.—CITY OF BIRMINGHAM GAS DEPARTMENT, See No. 12.

No. 107.—LIGHTING TRADES LTD.

At the stand of this firm are to be seen Curtis's and Harvey's "Ironclad" gas-mantles, a complete range of "Kildark" burners (which they have recently introduced), and specimens of glassware and attractive silk shades. Machinery has been installed to demonstrate a few of the processes involved in mantle manufacture; and specimens of raw materials are on view. A practical introduction is given to the "Kildark" burners, for they are used for lighting the stand; superheaters being in evidence. An outstanding feature of these superheater burners is that all parts in contact with products of combustion are aluminium; and this metal being non-corrodible, the burners require less cleaning, and in consequence retain their efficiency for longer periods. They can be fitted with either two or three bijou mantles or two No. 2 size. The burners for domestic lighting are also well displayed; the various types being shown in the different finishes with which they can be supplied.

Nos. 108-12.—CITY OF BIRMINGHAM GAS DEPARTMENT, See No. 12.

No. 113.—E. W. PROCTER.

This exhibit comprises different sizes and types of "New Triton" gas fish-frying apparatus. This fryer was fully described and illustrated in "THE GAS SALESMAN" for March last, pp. 40 & 41.

Nos. 114-15.—COOKERY DEMONSTRATION ROOM [See General Report].

No. 117.—MESSRS. ALDER AND MACKAY, LTD.

The gas-meter, which is one of the best-known features in a house, is very little understood so far as its internal construction is concerned, and also as to its method of working. It is very seldom recognized that a gas-meter is a legal measuring instrument, and can only remain in use when it complies with all the conditions laid down under the "Sales of Gas Acts," and that the care taken in its manufacture is as great as pertains to the production of a good watch. The treatment given to the meter is, however, in most instances vastly different from that given to the watch. The latter is carefully tended, usually every twenty-four hours; but the ordinary meter is relegated to some position where the principal concern is that it shall be out of the way. All the attention it receives is when the inspector comes along to read the consumption; no thought being given to it until his next visit. Still, silently and in its unobtrusive seclusion, it is performing faithfully and accurately the recording of every foot of gas consumed, until after long years of service old age comes upon it.

One of the "A. & M." prepayment meters (in a glass case) is shown in action at the front of the stand, giving everyone an opportunity of examining the legal measuring instrument constructed exactly similarly to the meter in use in the house or workshop. A show case can also be examined containing the following materials:

Persian leather from India.	Tin from Cornwall.
Almond oil from Smyrna.	Colza oil from Russia.
Wool from Australia.	Copper from Spain.
Olive oil from Italy.	Antimony & lead from Newcastle.
Zinc from Belgium.	Tinplate from South Wales.

All of these are employed to make a prepayment meter.

An interesting exhibit is a collection of hairpins, babies' feeding bottle rings, &c.; examples from various places provided by an attempt to swindle the meter. The "A. & M." pressure-wave controller for public lighting is the firm's own patent, and gives control of the public lighting from the gas-works or district governor; and a model installation is in operation at the stand. The "A. & M." hurricane-proof copper street gas lanterns are also shown, together with various types of test meters, pressure gauges, pressure registers, and other gas-works appliances. The firm's latest disc-pattern prepayment and new standard meters are also exhibited.

No. 118.—J. H. ROBINSON & CO. (LIVERPOOL), LTD.

On view and working, this firm have models of their well-known "Excelall" dry gas-meters, of the lubricated type. Many thousands of these meters are in use in this country, and considerable numbers are exported to all parts of the world. The prepayment attachment, which is fitted to coin meters, is unique in design, and is capable of being adapted for penny or shilling coins at the discretion of the corporation or gas company. Its advantages are many, and obviate the necessity for carrying two stocks of meters. They have also on view a small-type dry meter which has been designed for the passing of large volumes with a minimum loss of pressure, and which can be placed in confined spaces. There is also one of their large-capacity compensating wet meters, which combine many advantages over the old type, both for passing large volumes, and also in case of repair. Experimental meters of various designs, both in wet and dry types, are shown at work. A complete installation for the testing and verification of meters, as accepted by the Board of Trade, is also shown; and demonstrations are given of gas-meters being tested prior to handing over to the inspector for verification and stamping purposes. King's gauges are shown; and a complete set of component parts of a No. 3 standard meter is arranged on a neatly-covered frame.

A range of gauges, from 6 in. to 24 in., including differential gauges, is mounted on a frame. As the firm also manufacture enamelled dials and scales, a few of the various kinds are exhibited. A large selection of mounted photographs of various kinds of gas-apparatus manufactured by them, which include station meters, both ordinary and large capacity, fitted with their improved drums, which reduce the resistance of the vanes on the water to a minimum and allow a considerable increased velocity of the drum, thereby increasing the capacity of the meter, are also shown. There are photographs of 60,000 and 100,000 c.ft. per hour drums, illustrating their construction. Station governors of the equilibrium type, and fitted both for weight and water loading, are also shown. A large assortment of pressings and stampings are to be seen, including brass repetition work of all kinds. Their various types of diaphragm, and the methods of manufacture, are also exhibited.

Nos. 120 to 125.—HISTORICAL SECTION [See pp. 845-6].

No. 126.—THE EVESON COAL AND COKE CO., LTD.

Gas coals of various grades, together with the bye-products—gas coke, furnace coke, crude benzole, ammonium sulphate, &c.—derived from them, are exhibited by this firm. At the stand of their subsidiary concern (the Staffordshire Tube Company, Ltd.) iron tubes and fittings for gas, water, and steam are shown, and also paint specialities for structural steelwork, gasholders, &c. An important feature is made of acid and alkali resisting paints, and those suitable for boiler coatings.

No. 127.—THE STAFFORDSHIRE TUBE CO., LTD.

The Company make a display of all descriptions of lap-welded and butt-welded tubes and fittings for gas, water, and steam.

No. 128.—A. E. PODMORE & CO.

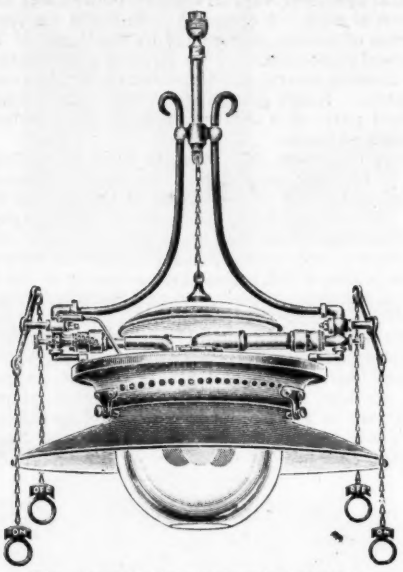
The "Ivex" dust-proof burner, with superheated air, and interchangeable nozzles from bijou to standard-sized universal mantles, forms a prominent feature of this stand. The "Ivex" domestic inverted burner is an adaption of one of the earliest Podmore patents for intensive superheated upright burners, wherewith the air to feed the burner and mix with the gas was drawn down two tubes to the dust-proof bunsen mixing chamber, from an air box surrounding the chimney. Now the "Ivex" is supplied with preheated air, drawn through three tubes attached

The "Ivex" Burner.

to the corona band from below the outlet for the products of combustion to a central mixing chamber above the head of the burner, where the gas and air are thoroughly mixed. Each inlet or air port is provided with a shutter, so that the burner can be used over a range of calorific values. Where gas is supplied definite in calorific power, specific gravity, and pressure, a suitable nipple can be fitted, and the adjustment device be dispensed with. This well-known burner is displayed in many forms.

There are superheated cluster burners with dual control—one tap controlling (say) five mantles, and the opposite tap controlling two mantles—and a number of other patterns suitable for widely

varying purposes. It should be added that the "Ivex" superheated burner is being made in large units for foundries and the lighting of big spaces. Then attention may be called to the firm's safety garage lamp, made on the Davy lamp principle, with pure nickle gauze head. This can be either one light or fitted with a



The 'Ivex" Indoor Lamp—dual control.

three-light cluster superheated chamber burner. The "Bourne" high-power low-pressure lamp is to be had in all-copper or part-enamelled and copper, and with each burner under separate control. Every part is detachable and renewable. In fact, it has been specially designed for shipment in parts, so as to reduce bulk and cost of freightage. There are specimens of the lamps that have been supplied for part of the street lighting of Calcutta, for the public lighting of Ceara, Brazil, and for the lighting of the main roads between Bournemouth and Poole. Other items are gas-irons of the latest pattern, for which a very small consumption of gas is claimed, "Metropolitan" meters, with duplex gas controllers for public lighting, Godson's patent pilot lights, adaption sets, and last, but not least, the "Howellite" burner, for the sale

The "Bourne" Outside Shop Lamp.

of which Messrs. Podmore have been appointed sole agents. With reference to special adaption sets, it may be said that between 2000 and 3000 of these are in use in the town of Bournemouth, under the Corporation. These have been successful during the number of years they have been in use—giving excellent lighting with very low maintenance costs. "Ivex" artistic spider fittings, adapted to domestic lighting, are displayed—for indirect lighting with "Vitreosil" bowls or onyx glass.

The firm are lighting one of the gangways with their patent dual-control superheated divided gas box lamps, of the type already referred to, whereby two burners or five burners may be used at will.

No. 131.—LOUNGE.

No. 132.—THE SIGMA INSTRUMENT COMPANY.

This firm are exhibiting a series of gas calorimeters. These include indicating and recording calorimeters for use with purified or unpurified gas, and also a new water flow calorimeter which has the feature of easy access to the water space. The ease with which deposits from the water can be removed eliminates the necessity and expense of supplying the calorimeter with distilled or soft water. An instrument of use to those who employ gas for heating, stoving, and drying ovens is also exhibited. It automatically regulates the flame and gives more uniform temperatures than can be obtained by hand regulation. Another appliance of novel construction is a pyrometer based on the expansion of air with rise of temperature. The one exhibited is specially adapted for measuring the temperatures of molten non-ferrous metals. Two separate CO_2 indicators are on view. One is suitable for flue gases, depending for its action on the increased density of the flue gas compared with the air. Working as it does without chemicals, and without a filter, rapidly indicating all changes in the flue gas, it overcomes the chief defects in combustion instruments. The other instrument is of the absorption type, and is suitable for determining the percentage CO_2 in any kind of gas.

Nos. 133 & 134.—CITY OF BIRMINGHAM GAS DEPARTMENT, See No. 12.

Nos. 135 & 136.—Reserved for the display of bread and foodstuffs submitted in connection with the cookery competitions.

No. 138.—BIRMINGHAM CHAMBER OF COMMERCE.

Information relative to the trade of the district and Midlands generally will be available to all inquirers—those who wish either to buy or to sell—as well as details in regard to foreign tariffs, customs duties, &c.

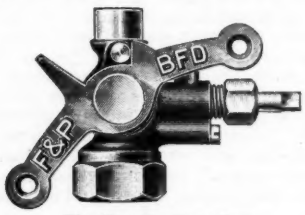
The Chamber of Commerce is also responsible for the organization of the British Industries Fair, Birmingham Section, which will be held in May next at the Castle Bromwich Aerodrome. Full particulars with regard to this may be obtained at the stand by intending visitors or buyers. It is interesting to note that the schedule of the Birmingham Section includes all manufactures appertaining to the gas industry.

No. 139.—MESSRS. FOSTER AND PULLEN, LTD.

This Company maintain that a firm foundation is just as essential to durability and rigidity in a street lantern as it is in a house; and they claim that this is provided by the "Avil" cast brass bottom frame as patented by them.

Simply to form the lantern bottom of sheet metal, and bolt direct to the frog by means of the astragal rods, makes this part of the lantern—which should be the strongest—the weakest. It also renders it difficult to remove the lantern for inspection or repairs. The astragal rods and nuts become corroded in place; and such force has to be used to loosen them that a great strain is put on the whole lantern frame—often with disastrous results.

The "Avil" cast brass bottom frame is a strong rigid casting. The astragal rods are secured in the inner holes at the corners, and the extended lugs with outer holes are used for attaching the lantern to the frog by means of short, loose bolts. As a result the lantern is strong where strength is needed. It may be taken down easily at any time, simply by unscrewing the short bolts. The bottom frame has been a complete success from its introduction, and has been applied to many thousands of lanterns. It is made in a large variety of patterns and sizes to meet all requirements

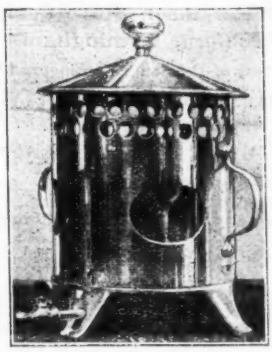


The New By-Pass Cock.

The firm are also exhibiting a new by-pass cock for outside lighting, fitted with an auxiliary plug (instead of screws) for regulating the by-pass flame. The old screws were generally a source of trouble, becoming corroded in position. The height of the by-pass flame is regulated by means of the plug; and a quarter turn one way makes it a flashing by-pass cock, and a quarter turn the opposite way makes it a constant pilot. The height of the flame being regulated in each case by the amount of turn given. The new cock has been very successful.

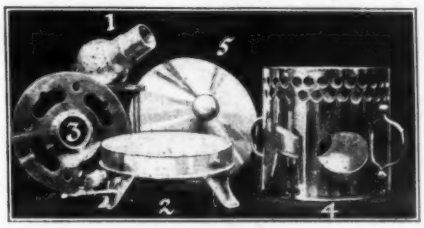
Billiards, more than any other game, require perfect artificial light; and it is in supplying this requisite that the "Avil" patent

pendant has achieved its success. It has only three burners, consuming in all about 11 c.ft. of gas per hour; but, owing to the manner in which the burners are fixed, and the use of special shades, the light is perfectly distributed, and a full-sized table is brilliantly illuminated. The anti-vibration holders protect the mantles against shocks or vibration; and the cost of maintenance is therefore remarkably low.



The "Tropic Heater."

Another interesting exhibit is the "Tropic" heater, which is a small gas radiator weighing only 4 lb. 7 oz. The heating surface approximates to 200 sq. in.—a big ratio to its size. It is claimed that the gas consumption is below 4 c.ft. per hour, at a cost of less than one farthing. All parts of the heater, which is



Working Parts of Heater.

silent in action, are made of aluminium; and consequently its appearance is most attractive. Water can be quickly boiled while the room is being warmed. The heater is thus admirably suited for use in sick rooms.

No. 140.—COMPETITION ENTRIES RECEIVING ROOM.

THE HISTORICAL SECTION.

One of the most interesting features of the Exhibition is the Historical Section. Here there is a large number of fascinating exhibits which serve to impress one as to the magnitude of the progress made since the discovery of the "spirit" of coal. In this connection the Public Libraries Committee of the City of Birmingham have loaned a very fine selection of Murdoch relics from the Boulton and Watt Collection in the Birmingham Reference Library. The following is a list of the many exhibits.

From the Boulton and Watt Collection in the City of Birmingham Reference Library, loaned by the Public Libraries Committee.

1. Bust of Murdoch.
2. Photograph of the unveiling of the bronze panel at Bello Mill, Lugar—the birthplace of William Murdoch.
3 & 4. Photographs of William Murdoch.
5. Photograph of the birthplace of William Murdoch.
6. Book on "The History of the Introduction of Gas Lighting."
7, 8, & 9. Photographs of the birthplace of William Murdoch.
10. Photograph of a tablet placed by Messrs. Tangye Bros. in the wall of Murdoch's house at Redruth.
11. Photograph of Murdoch's mural monument in the chancel of the Parish Church, Handsworth, Birmingham.
12. Photographs showing—(1) Murdoch's house.
(2) ,, retort-bench.
(3) ,, gasholder.
(4) ,, purifiers.
13. Photographs showing—(1) Murdoch's birthplace.
(2) House in Redruth.
(3) Sycamore House, Handsworth.
14. Blue print of William Murdoch's invention.
15. Letter dated Feb. 7, 1806, from William Murdoch (Manchester) to Messrs. Boulton and Watt (Soho).
16. Letter dated Aug. 18, 1802, from William Murdoch (Glasgow) to Messrs. Boulton & Watt (Soho) concerning various orders for engines.
17. Letter dated June 14, 1795, from William Murdoch (Redruth) to James Watt.
18. Letter dated March 1, 1800, from William Murdoch (Redruth) to James Watt, Jun. (Soho).
19. Letter dated Jan. 1, 1806, from William Murdoch (Manchester) to Messrs. Boulton & Watt (Soho).
20. Photograph of letter, Jan. 1, 1806.
21. Letter dated Dec. 20, 1805, from William Murdoch (Manchester) to Messrs. Boulton & Watt (Soho).
22. Letter dated May 11, 1795, from William Murdoch (Redruth) to James Watt, Jun., (Soho).
23. Letter dated Feb. 5, 1806, from William Murdoch (Manchester) to Messrs. Boulton & Watt (Soho).
24. Letter dated Sept. 14, 1807, from William Murdoch (Redruth) to James Watt (Soho).
25. William Murdoch's scheme of an expansion engine.
26. Travelling and other expenses of William Murdoch, December, 1805, to November, 1806. Dated Nov. 24, 1806.
27. Travelling and other expenses of William Murdoch, March to July, 1812.
Letter dated July 21, 1812, from William Murdoch to Boulton and Watt (Soho).
28. Letter dated Aug. 22, 1797, from William Murdoch (Redruth) to James Watt (Soho).
29. Book—catalogue of old engines—see page 195, giving particulars of lighting apparatus in different years, 1805 to 1812.
30. Five drawings relating to Messrs. Phillip & Lee's gas installation 1805-08.
31. Photograph of William Murdoch.
32. Book—"Lights without a wick."
33. Pamphlet—"Earliest loco in England."
34. Pamphlet—"The first locomotive."
35. Photograph—"First loco in Glasgow."
36. Drawing—Symington, 1786.
37. Pamphlet—"Remarks on Bill *re* Gas Light and Coke Company, 1809."
38. Pamphlet—"Gas Light Bill."
39. Leaflet—"Tangye's steam carriage."
40. Card—"First retort-house."
41. Leaflet—Prefatory note to reprint of Murdoch's letter.
42. Card—William Murdoch.
43. M.S. Book—Murdoch's notebook.
44. Leaflet—Illumination of Soho manufactory.
45. Pamphlet—Letter to a Member of Parliament from William Murdoch, 1809.
46. Specification for heating of Handsworth Church. Manuscript (5 sheets).
47. Letter to James Watt from John Murdoch, March 15, 1810. Manuscript.
48 Drawing of Murdoch's bellows made in Cornwall, 1781. Manuscript.
49. Letter, Nov. 5, 1812, from William Murdoch to James Watt *re* trouble with workmen.

Loaned by Mr. J. E. Vale, of Handsworth.

50. Case containing—
(*a*) Four earthenware vessels used to contain oil and wick for illuminating purposes before the invention of gas.
(*b*) Medallions of George III. and Crown. These medallions were turned in the lathe invented by Wm. Murdoch on which he made his wooden hat.
(*c*) A letter to a Member of Parliament from Wm. Murdoch, 1809, and photograph.
51. Case containing—
Pieces of lead pipe taken out of the bank by the side of Sycamore House (formerly occupied by Wm. Murdoch) July 18, 1902.
52. Crown and Stars which formed part of the illumination at Soho Foundry 121 years ago.

Loaned by the City of Birmingham Gas Department.

53. Gas stove for lighting and heating, patented by George Neale, Northampton, Sept. 27, 1856.
54. 10-light dry meter constructed by N. Defries, patented in 1845.
55. A Giles patent gas kitchener constructed at Blackheath, showing flue outlet near bottom of stove.
56. A notebook used by the late Mr. Joseph Chamberlain, the first Chairman of the Corporation of Birmingham Gas Committee, containing notes relating to the transfer of the gas-works from the Company to the Corporation.
57. Share certificate of the Birmingham and Staffordshire Gas Light Company, 1835.
58. Gas account, dated March 25, 1823, from the Birmingham Gas Light and Coke Company for gas supplied to Cannon Street Chapel.
59. Gas account dated April 11, 1837, from the Birmingham Gas Light and Coke Company, for gas supplied to Mr. Worsey, of No. 80, Bromsgrove Street.

Loaned by Mr. W. H. Bennett (Managing Director of the Redhill Gas Company).

60. Photograph of the London Gas Light Company, Vauxhall Works.

61. Copy of Hazeldine's terms for the supply of gas in cylinders, 1837.
62. Copy, with signature of F. Winsor, of combined admission card and prospectus of the National Light and Heating Company, 1807.

Loaned by Walter King, Ltd. (Proprietors and Publishers of "The Gas Journal" and "The Gas Salesman").

63. F. Accum's two books on "Gas Lighting," 1815.
64. Matthews' "Compendium of Gas Lighting," 1832.
65. T. S. Peckstone's "Practical Treatise on the Manufacture of Gas," 1841.
66. "Gas Gazette" published on May 10, 1847.
67. Vol. I. of the "Journal of Gas Lighting" published 1849-1854. (Editor, Thomas G. Barlow.) 2 books.
68. S. Clegg, Jun. "Treatise in the Manufacture and Distribution of Coal Gas," 1853.
69. "Gas and Water Times" published in 1857.
70. S. Clegg, Jun. "Treatise on the Manufacture and Distribution of Coal Gas," 1859.
71. Documents and evidence in the case of Alex. Angus Croll *v.* The Great Central Gas Company—in the fifties.
72. Gas Tracts published in 1864.
73. Copy of first edition of Thomas Newbigging, A.I.C.E., "Newbigging's Handbook" published in 1870.
74. Two framed photographs showing early gas-works—one of them designed possibly in 1815.

Loaned by Wilsons and Mathiesons, Ltd., Leeds.

75. Photographs of original catalogue which dates to about 1879, and is practically a list of goods which were exhibited at the Birmingham Exhibition held in the Town Hall in 1879.
76. Old gas-fire with gauze wire front.

Loaned by the Stockport Gas Department.

77. Form of rules for consumers of gas of the Stockport Gas Company, 1825.
78. Copy of annual account of the Stockport Gas-Works, 1845.
79. Circular glass case dry meter by Defries.
80. Old pattern meters—
    (*a*) 2-light wet meter.
    (*b*) Clegg's patent wet meter.
81. Glass-case dry—
    (*a*) Thomas Glover, 5-light dry meter, 1883.
    (*b*) J. Boulton, 3-light dry meter, 1863.
82. Letter to a gas consumer, 1853.

Loaned by the Sudbury Gas and Coke Company, Ltd.

83. Drawing by Geo. Malam, dated 1836, of the original Sudbury Gas-Works.

Loaned by Mr. W. J. Sandeman (Croydon Gas Co.).

84. A book on gas lighting, 100 years old.

Loaned by Mr. L. E. Twycross (Assistant Engineer of the Cheltenham Gas Light and Coke Company).

85. An ancient district governor made up in a wooden tub.
86. Photograph of governor when it was working.

Loaned by the Wellingborough Gas Light Company.

87. Frame containing—
    (*a*) Regulations for the use of gas, and scale of prices per annum, 1833.
    (*b*) Bill and receipt for gas consumed for cooking at 15s. per 1000 c.ft., 1840.
    (*c*) Notice of reduction in price of gas from 15s. to 12s. 6d. per 1000 c.ft., 1845.
88. Cooking-stove by Sharp, Northampton, about 1850.

Loaned by the Newcastle-upon-Tyne and Gateshead Gas Company.

89. Framed advertisement "Gas Lights." Consumers' instructions issued by the Fire Office, Newcastle, Nov. 15, 1817.
90. A gas-cooker made in Halifax in 1870.
90a. Section of piping unearthed when laying new mains at Wylam-on-Tyne (100 years old).

Loaned by the Kidderminster Gas Company.

91. Old price card.
92. Photograph of gas managers taken in the North of Scotland between 50 and 60 years ago.

Loaned by the Reading Gas Company.

93. Souvenir booklet issued on the occasion of the Jubilee Celebrations of the Reading Gas Company.

Loaned by the Gas Light and Coke Company.

94. An early book by Frederick Accum dealing with the manufacture of coal gas, 1819.
95. Photograph of the Royal Charter granted by King George III. to the Gas Light and Coke Company, 1812.
96. Prospectus and terms of sale of a "New Invention for Manufacturing Gas," by Mr. Broadmeadows, of Abergavenny, 1824
97. Particulars and drawings of an early gas-making plant.
98. Box made of wood obtained 25 ft. below the surface of the ground in digging foundation for the Beckton Gas Works, 1869.
99. Centenary celebration booklet giving an account of the progress of the Gas Light and Coke Company from its incorporation by Royal Charter, 1812.
100. Model of the late Whitefriars Gas-Works on Victoria Embankment. Closed about 1869.

Loaned by the Parkinson Stove Company, Ltd., Stechford, Birmingham.

(By the courtesy of the South Kensington Museum.)

101. One of the first "Geysers," invented by E. W. Maughan about 1868.

Loaned by Mr. J. Mogford, Briton Ferry.

102. Dr. Watson's Essays—5 vols.
103. First editions of F. Accum's—2 vols. 1815.
104. Lavoisiers' Chemistry 1793, with plate showing his floating-bell gasholder.
105. Imison's School of Art—2 vols. 1803. Vol. 2 shows a floating-bell holder.
106. Lectures on select subjects by James Ferguson, F.R.S., 1823, with plate showing oil-gas plant used by John Taylor in 1815.
107. "Fossil Fuel," the "Collieries and Coal Trade, 1835," with Beecher's account of "the production of tar, coke, &c.," and his method whereby he caused coal to throw out such flames that a foot of coal should make a flame 10 ft. long."
108. "Theory and Practice of Chemistry" by John Berkenhout, M.D., 1788, with plate showing Priestley's apparatus for decomposing water.
109. "The Blessed Effects of Gas Lights," dated Nov. 10, 1813.
110. A card showing the prices charged per light per quarter before meters were used, per the terms and conditions of the Bodmin Gas Company.
111. Plans dated 1820 to 1850.
112. Dictionary, 1853, of Arts, Manufacture, and Mines—2 vols.
113. S. Clegg (Junior) on "Manufacture and Distribution of Coal Gas," 1868.
114. Fredk. Colyer, M.I.C.E., M.I.M.E., on "Gas-Works," 1884.

Loaned by the Oldbury Gas Department.

115. One 2-light tin-cased Crossley meter, 1849.

Loaned by the County Borough of Smethwick Gas Department.

116. Photographs framed—
    (*a*) Cottage in which Wm. Murdoch was born.
    (*b*) House in Redruth.
    (*c*) House in which Wm. Murdoch died.
117. Photo framed—
    A gasholder fixed by Murdoch at Messrs. W. T. Avery's works, Soho, Birmingham.
118. Murdoch's house, which is still in existence to-day.
119. A gasholder fixed by Murdoch at Messrs. W. T. Avery's works.

Loaned by Messrs. W. Sugg and Co., Ltd., Westminster, London.

120. A case of burners showing the various constructions from the old iron burner of the early days of gas lighting to the time of the introduction of the incandescent gas-burner.

Loaned by the Redditch Gas Company.

121. Bust of Murdoch.

Loaned by Messrs. Geo. Bray & Co., Ltd.

122. (1) First Bray burner, 1865.
    (2) Cockspur burner.
    (3) Iron batswing burner.
    (4) Heron burners, 1879.
    (5) Brönner burner, 1868.
    (6) Iron union jet burner.
    (7) Metal slit union burners, 1860.
    (8) Steatite union burners.

A New Electric Switch for Lighting and Extinguishing Gas-Burners.

In the speech of Mr. John Wilson at the North British Association meeting reported in our last issue, referring to Mr. Stones' paper on "Our Lighting Load," he said: "Electricity has made great strides in the past, chiefly due to one reason—simplicity of operation." . . . "When we can control all our lights from one little switch, conveniently placed, when we can give equal convenience, then we shall have a chance of winning the field." By a curious coincidence, we publish this week on our "Stock Market" page the abridged prospectus of a Company formed to exploit a new type of electric gas-switch which seems to possess important possibilities.

British Association Meeting.—The publication of some interesting notes from the British Association meeting is deferred to next week.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

Official Inauguration of the "Dempster-Toogood" Vertical-Retort Installation and Reconstructed Gas-Works at Great Harwood.

THE official inauguration of the Dempster-Toogood vertical installation and the reconstructed gas-works at Great Harwood, was attended, last Wednesday, by a large and representative company of gas engineers and members of local authorities, among which may be mentioned Accrington, Great Harwood, Church, Rishton, and Clayton-le-Moors, included in the sphere of operations of the Accrington and District Gas and Water Board.

Luncheon was served in the Mercer Hall. Alderman D. C. Dewhurst (Accrington), Chairman of the Board, presided, and was supported by Councillor E. Woolley, J.P. (Mayor of Accrington), Messrs. A. H. Aitken (Clerk to the Board and Town Clerk of Accrington), S. Tagg (Preston), J. W. Broadhead (Managing Director of the firm of contractors), J. W. Cooper, J. Barlow, W. H. Dixon, J. Grunshaw, G. H. Ellis, J. Sudall, J. P. Leather (Burnley), J. Becket, Alderman W. H. Rawson, Alderman J. Waddington, Messrs. R. W. Broadhead, J. W. Scott, E. J. King, H. J. Toogood, J. R. Booth and J. T. Hope (representing Rishton Council), J. Bentley and F. Boothman (representing Great Harwood), J. Riley, and A. J. Harrison, Gas Engineer and Manager to the Board.

Mr. S. TAGG (President of the Institution of Gas Engineers) proposed the toast of the Board, and observed that thirty years ago the members anticipated the growing recognition of a centralization of services and grouping of areas, for the Board was then formed to supply gas and water to Accrington, Church, Rishton, Great Harwood, &c. He knew of no service which would so add to the amenities of ordinary life, and so relieve the housewife of much unpleasant and laborious work, as that of an adequate and cheap supply of gas. The works at Great Harwood were admirably laid out, to meet not merely to-day's needs, but the needs of the future; and the whole scheme reflected the greatest credit on the Board and on their Engineer and Manager, Mr. Harrison. The Board had a long record of usefulness to the community, and with the able assistance at their command they might look forward to many years of prosperity. Particularly were they fortunate to have a Chairman like Alderman Dewhurst, who had presided over their deliberations for twenty years.

Alderman DEWHURST responded. He said that though for a long time the question of closing the Accrington Works had formed a subject of discussion, it was not until 1919 that the Board had a complete scheme placed before them by their present Engineer. Mr. Harrison had said, "In five years, with your support, I will reconstruct the gas-works and bring the undertaking up-to-date." They had allowed him the five years, and he was given all the loyal support possible; and he left the representatives to judge after the inspection whether their confidence as a Board had been misplaced. Only those who knew the old works could have any conception of the wonderful change which had taken place. There was hardly a pipe, stone, or slate which had not been overhauled, or renewed. Many would be surprised to learn that apart from the new retort-house, the buildings had been reconstructed out of old material taken from the Accrington works. This was more difficult than building from new material, but it was a policy which had saved the Board considerable cost. The levels of the old site had been raised about 6 ft.; and to-day the works were a testimonial to Mr. Harrison's skill and ability. The enormous amount of reconstruction did not cover all. The whole system of management had been changed, and assistance had been given to consumers in the form of advice as to how to use gas properly and economically. Their Distribution Department continued to make headway in face of strong competition. It would be a surprise to some to learn that since Mr. Harrison took up his position with them, his go-ahead policy had resulted in the fixing of 5000 gas-appliances for domestic use; and without exception these had given entire satisfaction. The old system of administration had been remodelled; and they might justly claim to be giving better service than ever before. It was not their intention to rest until they had placed the undertaking in a favourable position compared with others of similar importance.

Alderman JAMES WADDINGTON, J.P., proposed the toast of the contractors, Messrs. Robert Dempster & Sons, and he coupled with them the name of Mr. J. W. Broadhead, the Managing Director of the firm. He also included other contractors who had carried out important work—viz., Messrs. R. & J. Dempster, of Manchester, and Messrs. Taylor & Co., of Bolton. He stated that Messrs. R. Dempster had important contracts all over the world. It was true that the present scheme was somewhat costly; but this was inevitable owing to the high cost of materials prevailing at the time, and to the fact that the work could not be delayed if adequate supplies of gas were to be maintained. The contractors were to be complimented on the expeditious manner in which they had discharged their duties. The speaker paid a glowing tribute to the Engineer and Manager, Mr. Harrison.

Mr. J. W. BROADHEAD, in reply, said that two years' experience of the work had more than borne out their anticipations; and he congratulated the Board on the great confidence so well placed in Mr. A. J. Harrison, who had, without outside advice, carried the thing through. He presented a solid-silver rose-bowl to the Chairman of the Board, Alderman Dewhurst, as a memento of the occasion, the inscription reading: "Presented to Alderman D. C. Dewhurst, J.P., O.B.E., Chairman of the Accrington and District Gas and Water Board, by Messrs. R. Dempster & Sons, Ltd., Elland, on the occasion of the official opening of the Dempster-Toogood vertical installation at Great Harwood Gas-Works, 1923."

Councillor E. WOOLLEY, J.P. (Mayor of Accrington), proposed the toast of the visitors.

Mr. ALEX M'KAY (Chief Engineer of the Stoke-on-Trent Gas Department), in reply, said the Stoke authority were carrying out a large scheme in their Borough. They had six works, and were hoping that in five years five of these would be closed.

Mr. A. BROWN (Denton) also replied. He said that since the war they at Denton had had difficulties with the reconstruction of their works. As was the case at Great Harwood, horizontal retorts had been changed to vertical ones; but apart from the coal difficulties, they at Denton were now faced with the tremendous slump there was in the hat industry, which was the staple trade of their district.

Alderman W. H. RAWSON (Accrington) proposed the toast of the Gas Engineer, Mr. Harrison, whom he described as a practical man as well as a theorist.

Mr. HARRISON, in reply, said he looked upon the new works as a sort of Noah's Ark, and he hoped they would prove as useful. He considered that gas afforded the only solution of the smoke problem. Gas would unquestionably remain the chief source of light and heat for the greater part of the community so long as the coal resources of the country lasted, because it gave back to the land, in some form or other, practically all that it took. He hoped to be able to continue to serve the Board honestly and fearlessly.

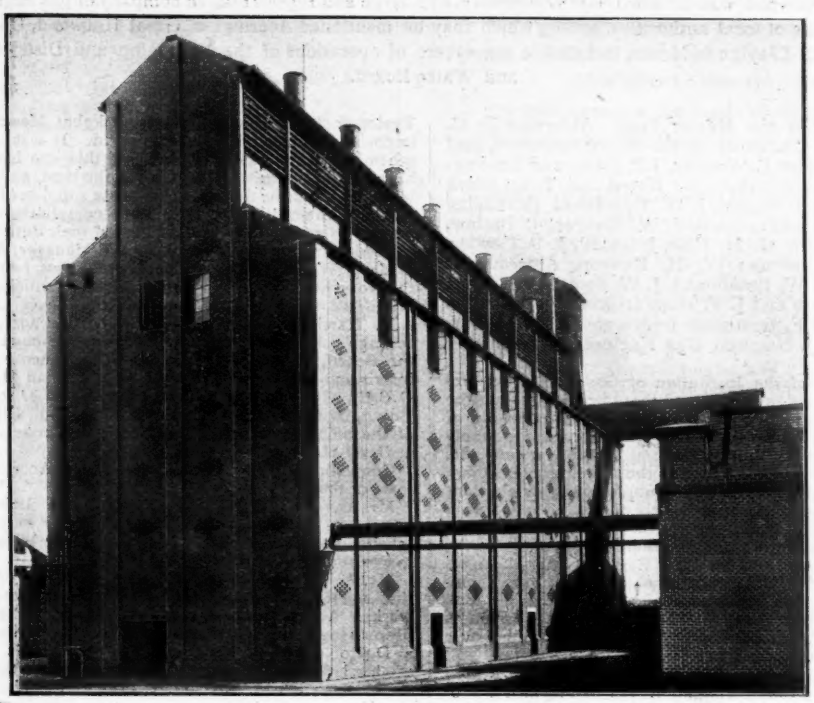
HISTORY OF THE UNDERTAKING.

In 1841 an Act was obtained to light with gas and to supply with water the townships of old and new Accrington and Church. The capital of the Company was fixed at £7500, with power to borrow an additional £3000 and convert that sum into capital. A balance-sheet dated 1848 shows the receipts for gas to have been £1235, public lighting account £194, coke £23, and tar £3. The old Company progressed in a very satisfactory manner until 1894, in which year the Accrington District Gas and Water Board was incorporated. At that time the annual production of gas was 240 million c.ft.

The scope of this public utility undertaking is of considerable importance; the area of supply being about 22 sq. miles, and including the Borough of Accrington, the Urban Districts of Church, Clayton-le-Moors, Great Harwood, and Rishton, the townships of Altham and Huncoat, and part of the Borough of Haslingden, containing in all a population approximating 95,000. Application is also being made under the Gas Regulation Act, 1920, section 10, further to extend the area by taking in the township of Whalley and part of the township of Billington.

THE PARTY AT GREAT HARWOOD.

The Board control two gas-works, six water-storage reservoirs, two water-pumping stations, two water-filtering stations, and, in all, some twenty different depots, shops, and offices. The present annual production of gas is 530 million c.ft., and the annual consumption of water 806 million gallons; the gas being distributed through about 100 miles of mains, and the water through about 80 miles of mains. The capital authorized for gas is £592,422, and for water £607,922; the loans outstanding at March 31 being: Gas £434,453; water £439,268. For the same year the total revenue income for gas and water was £190,548 and the expenditure £109,455; the gross profits being £81,093, and the net profit, after meeting all capital charges, £26,335.

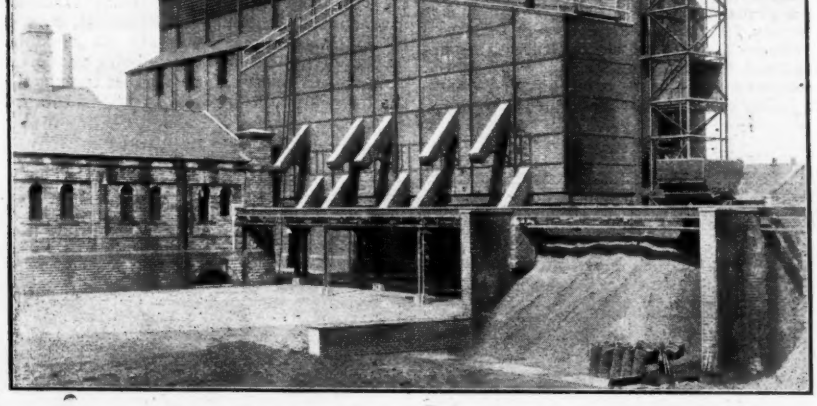


THE DEMPSTER-TOOGOOD HOUSE.

NEW SCHEME.

In 1919 the present Engineer submitted a scheme for the reconstruction of the whole gas undertaking, which particularly included the centralization of all manufacturing operations at Great Harwood. The official opening of the works by the Chairman of the Board, Alderman D. C. Dewhurst, J.P., O.B.E., on Sept. 12, marked the completion of this part of the scheme.

The scheme, which was launched in 1920, provided for the entire reconstruction of the carbonizing plant, new coal and coke handling plants, new railway connections, and improved methods of handling the wagons, additions to, and re-arrangement of, the condensing and wet purification plants, the provision of new steam boilers and steel chimney, a new exhauster, the reconstruction of the sulphate of ammonia plant, the erection of suitable workshops, stores, messrooms, laboratory, and weigh office, the construction of an underground tar-storage tank, renewing the guide framing on the large gasholder, and the general overhauling of the remaining plant, works, mains, and buildings.



SHOWING 300-TON CAPACITY REINFORCED 4½-IN. BRICK COKE-STORAGE BUNKERS.

The old works situated in the Accrington Borough (which, it may be interesting to note, contained parts of plant which had seen

over 80 years of service) is now closed down as a manufacturing centre; but part of the site will be retained as a storage and distributing station, the gas being conveyed to the holders from the Great Harwood works by means of a 6 in. diameter welded steel main, and boosted by a 60,000 c.ft. per hour reciprocating compressing set. This was the first part of the scheme to be completed; the steel main and jointing being undertaken by Messrs. Stewarts and Lloyds, and the compressors supplied and fixed by Messrs. George Waller & Sons, Ltd.

SITE.

The site of the Great Harwood works presented many difficulties; and much thought was given to the all-important question of the best lay-out for the new plant. The old horizontal retort-house and some parts of the plant being 5 ft. below the adjacent public roads and railway level, necessitated entirely new levels being determined for the erection of the new retort-house, and involved the alteration of most of the works mains. The block plan will show the suitability of the positions selected for the new plant and how well the new levels suit the reconstructed railway lines for economical handling of coal and residuals.

COAL HANDLING.

The coal wagons are brought from the Railway Company's yard over the public highway by level crossing, and marshalled where required on the gas-works sidings; coke wagons are similarly delivered to the yard ready for dispatch. The shunting of the wagons is undertaken by a self-contained battery-driven electric locomotive (see "JOURNAL," Oct. 4, 1922, p. 40). There are no live wires about the works; the batteries being charged at periods by gas-driven generators orginally installed for the horizontal-retort installation. The same plant is used to generate all the power required for the vertical-retort installation.

CARBONIZING PLANT.

The carbonizing plant, which is the main feature of the reconstructed works, is of the well-known "Dempster-Toogood" type; and this, with the coal and coke plants and railway sidings, formed the contract placed with Messrs. Robert Dempster and Sons, Ltd., Elland. The plant, a full account of which is given later, possesses many features of interest to gas engineers.

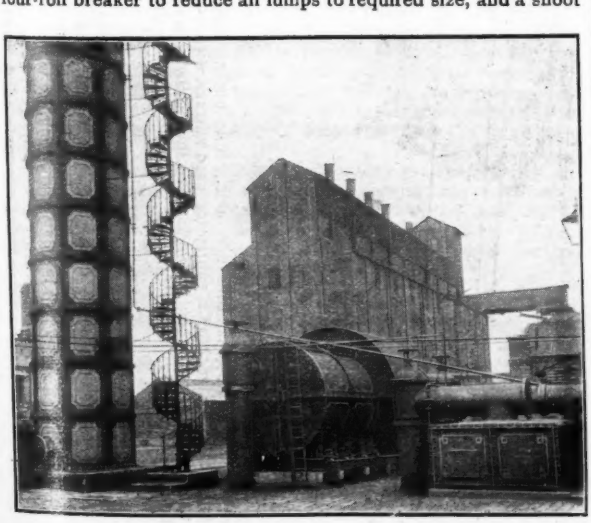
The whole of the excavations and foundations was carried out by the Board's staff; the subways of the dismantled horizontal retort-house saving considerable excavation. A solid foundation of monolithic concrete was put in to withstand the severe loading of the main stanchions supporting the vertical retort bench. The erection of the installation proper by Messrs. Robert Dempster was commenced in January, 1921, and gas-making started in November of the same year, so that the plant inspected at the official opening has seen nearly two years' continuous service. Its condition to-day speaks well for the good work put in by the contractors, and the care which has since been bestowed on it by the Board's staff.

WAGON TIPPERS.

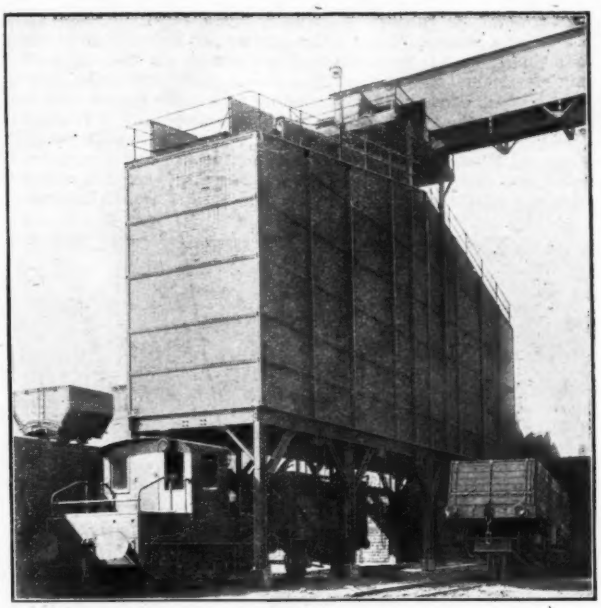
The two wagon tippers which were in service on the horizontal plant were taken out and re-erected in the new position. These are of the cradle type, electrically driven, and tip the end-door wagons to 45°; the object of the cradle being to lift the buffers clear of the rails. These tippers were originally installed in 1912 by the presont contractors for the vertical plant, and have seen continuous service since that time.

COAL BREAKER.

The breaker pit is furnished with a 10-ton capacity receiving hopper, a reciprocating feed to control the rate of handling (40 tons per hour, regardless of size of coal, thus preventing chokes), a screen and by-pass shoot, so that coal of already sufficient size need not be further crushed by entering the breaker, a four-roll breaker to reduce all lumps to required size, and a shoot



Livesey Washer, Rotary Scrubber, Tower Scrubber, and Vertical Retort Installation.



Another View of the Coke-Storage Bunkers.

to deliver all coal to the elevator boot. An unique feature is that the motion of the feed is taken from the elevator, so that as soon as the latter stops from any cause the feed to the breaker ceases, and the breaker continues idly, so that all damage by over-feeding is obviated automatically.

ELEVATOR.

The broken coal is elevated to the high level above the bunkers over the bench at 40 tons per hour by a cased-in bucket elevator. At the head of this a throw-over door is provided, so that the distribution to hoppers may proceed in either of two ways: 1. *Via* the rotary filler for distribution to all the compartments of the bunkers by the top strand of the gravity-bucket conveyor. 2. *Via* an auxiliary loading hopper and ball-bearing truck to any compartment of the bunkers.

GRAVITY-BUCKET CONVEYOR.

The gravity-bucket conveyor circumscribes the complete bench, and is so arranged, relative to both coal and coke plant, that simultaneously (*a*) its top strand handles coal from the elevator head to any compartment of the bunkers, or (*b*) its lower strand handles coke direct from the retort, and elevates it to the receiving hopper for the coke-screening plant.

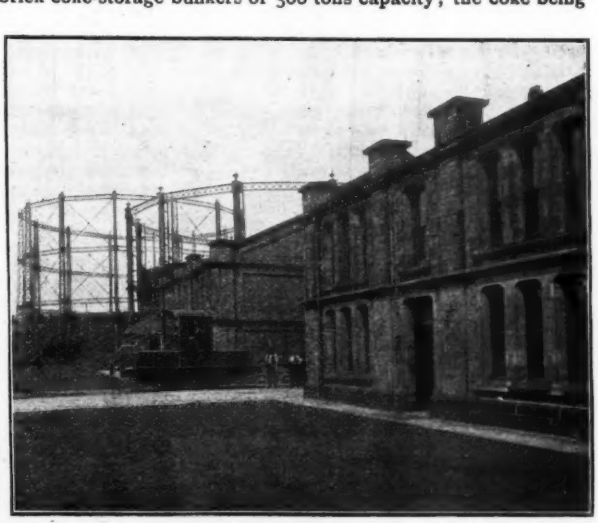
HOIST.

An electric hoist, of a capacity of 2 tons at 100 ft. per min., is installed in line with the bench, so that no curves or turntables are necessary. It is fitted with hinged rails and trip gear, so as always to be available immediately for—

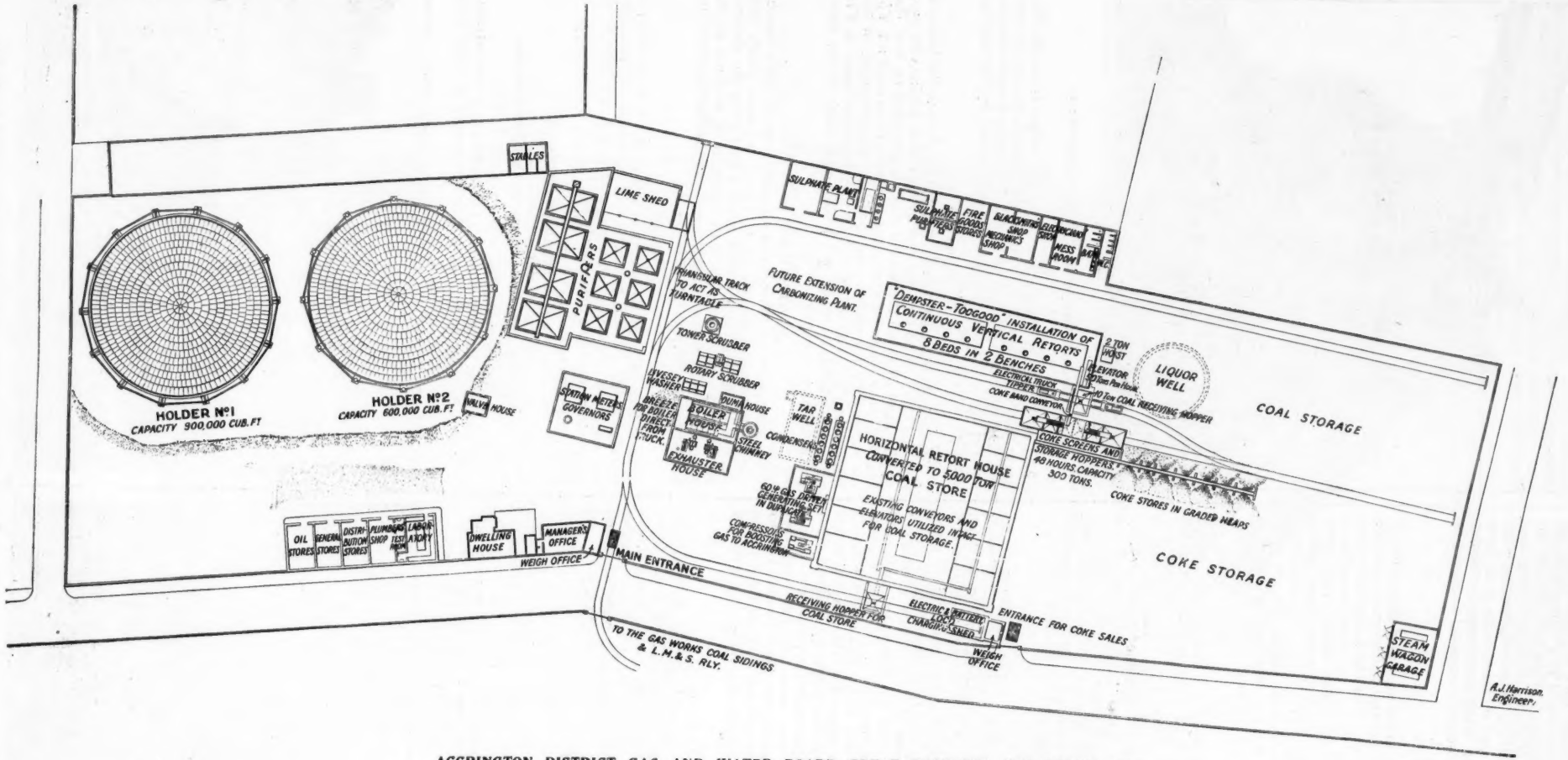
1. Passenger service to all levels.
2. At call for stokers' or bricklayers' material.
3. For handling coal to all compartments.
4. For handling coke to all compartments over furnaces.

COKE SCREENING AND STORAGE PLANT.

A feature of interest is the 4½-in. reinforced non-corrosive brick coke-storage bunkers of 300 tons capacity; the coke being



Exhauster House, Meter House, and Electric Locomotive.



ACCRINGTON DISTRICT GAS AND WATER BOARD—GREAT HARWOOD GAS-WORKS, 1923.

screened at the rate of 25 tons per hour. Side outlets load the surplus coke to a truck on a gantry for yard storage with a minimum of cost. Bottom outlets load coke into railway wagons, while further side outlets are fitted for loading into road vehicles.

Coke Gantry.

Originally there was a crane and gantry for stacking coke from the horizontal bench in the coke yard. This gantry has been utilized by running a 2 ft. gauge track down its length, and furnishing a 1-ton capacity ball-bearing coke truck, by which means surplus and graded coke can, with every economy, be stored in the yard; the main coke sales being always loaded direct from the large week-end capacity bunkers.

Coke Yard.

The coke yard is distinct from the rest of the works; a separate weigh office and machine being erected for dealing with all yard sales. The advantage of this arrangement is obvious in that it has entirely dispensed with any vehicle requiring to pass through the works proper. Situated in the coke yard is the garage for containing the steam wagon and motors used in distributing the coke over the Board's extensive area.

Condensing Plant.

The condensing plant consists of two batteries of the atmospheric type; one battery being removed from the Accrington Works and re-erected with the battery already in service.

Steam Plant.

The whole steaming plant has been re-arranged; the boilers being fitted with modern furnaces for breeze consumption. The position of the boilers has been reversed to facilitate the handling of the fuel from the coke yard, which is now brought direct from the breeze bunkers by railway wagons to immediately in front of the boilers. A new steel chimney, 90 ft. high, constructed by Messrs. J. Thompson and Sons, of Wolverhampton, has also been erected.

Exhausting Plant.

An addition to the exhausting plant has been made by the erection of an exhauster capable of dealing with 100,000 c.ft. per

hour; this being attached to an existing engine of local construction. The work was undertaken by the Bryan Donkin Company, Ltd., of Chesterfield.

PURIFICATION PLANT.

A new 3 million c.ft. capacity Livesey washer, erected by Messrs. Robert Dempster & Sons, Ltd., has been installed, and a similar capacity rotary scrubbing machine by Messrs. R. & J. Dempster, Ltd., while the whole of the connections have been re-modelled by the Board's staff. The purifying plant has been overhauled, and new conveying plant for handling the oxide is in course of erection.

STORAGE.

The storage comprises two gasholders at the Great Harwood Works and two at the Accrington depot; the total capacity being 2½ million c.ft. New guide framing for the large gasholder has been erected; this work being undertaken by Messrs. C. & W. Walker, Ltd., of Donnington. The station meter has been removed from the Accrington Works and placed alongside the existing meter. The capacity of these machines is 100,000 c.ft. per hour.

TAR STORAGE.

A new underground tar-storage well has been constructed; and this, along with two ranges of workshops, stores, messrooms, laboratory, &c., have been constructed by the Board's own staff. Nearly all the material used was taken down from the old Accrington Works and re-erected.

SULPHATE PLANT.

The sulphate plant put down by Messrs. R. & J. Dempster, Ltd., in 1909 has been re-housed, with the addition of a new type of combined dryer and neutralizer (erected by the same firm) which possesses many features of interest. The whole of the lead work in connection with this plant has been undertaken by Messrs. Joseph Taylor & Sons, of Bolton. Attached to this plant is an auxiliary boiler; the steam range being coupled up through the vertical retort-house to the works boilers, so that steam can be obtained from either source. The advantage of this arrangement in case of breakdown to either of the boilers is obvious.

CONCLUSION.

The condition of the Board's works in 1918 was such that only a bold policy of reconstruction could make the future supply of gas assured, and place the undertaking in a position comparable with other works of like importance. That this has in a large measure already been accomplished is to the credit of the Board; and we hope that the future has in store a large measure of success for them and for their Engineer and General Manager, Mr. A J. Harrison.

THE "DEMPSTER-TOOGOOD" SYSTEM OF (STEAMED) CONTINUOUS VERTICAL RETORTING.

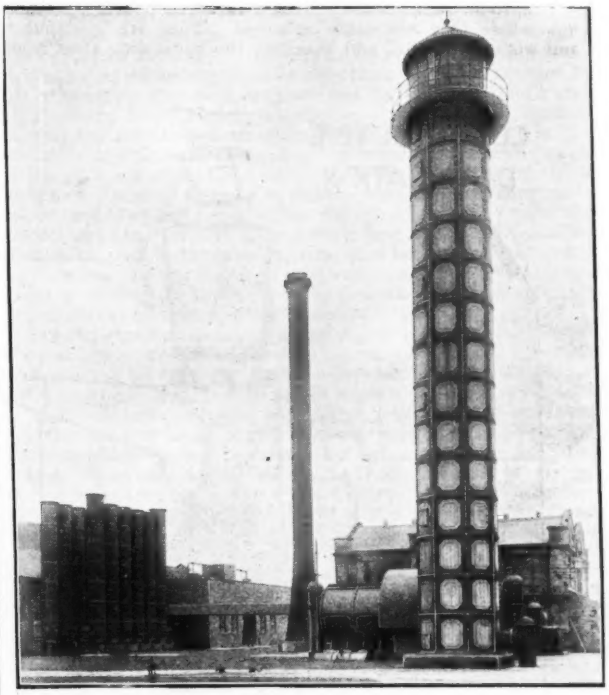
This installation consists of eight standard beds of four retorts each, making a total of thirty-two retorts in all. The beds are grouped as to four beds in one bench and four in the other, whereby expansion strains of the heated brickwork are kept within due bounds. The two benches are in series and are served with both coal and coke by the gravity-bucket conveyor, which completely encircles the retort-house, and by the 2-ton capacity electric hoist and truckways, the rails of which pass under the benches and over the top of the storage bunkers above the retorts. Though situated some 63 ft. above ground, these bunkers contain 320 tons of coal (48 hours', or a full week-end, capacity) and 80 tons of coke (72 hours' fuel for the furnace). Viewed from above, the bunkers are seen to be compartmented such that a coal and coke exit is furnished for every retort, and a coke exit for each furnace. Thus the *sine qua non* of the principle of vertical-retort carbonization—viz., the utilization of gravity—is applied to the utmost extent, as from this liberal storage not only the coal gravitates to the retorts, but the coke gravitates to the producer and to the retorts after periods of scurfing, at the will of the stoker. Thus all manual handling of material is obviated, and no week-end labour is entailed to replenish the hoppers. The many compartments of the hoppers are replenished either by the top strand of the gravity bucket conveyor or by the large ball-bearing trucks.

Access to this level is obtained by a staircase in easy flights, extending to the ground and with landing connections to all other working levels. The hoist, however, furnishes the most handy way, and it also gives access to all other working levels, so that the management can daily, and with great ease, supervise and control the working at every point.

THE BENCH TOP (38 FT. UP)—STOKING CONDITIONS.

At the bench-top level much of the stoker's work is performed; and as he is immediately over the heated brickwork of the retort bench, it will be interesting to consider how his comfort has been achieved, and facilities adopted to ease his labours. The paving is tubular and open to the atmosphere. These tubes are connected with the hollow chimney lagging of asbestos, whereby a current of atmospheric air is induced, which cools the paving so that the hand can rest on it without discomfort; and the radiated heat from the independent chimney is so considerably reduced that adjacent bench mountings are surprisingly cool to handle. The mountings are right and left handed, and the gas off-take pipes lead the issuing gases to be dealt with in cool positions external to the bench brickwork, whereby ample working-space is obtained to the betterment of conditions and work.

In order that the carbonizer may construct the conditions best to suit each individual retort, and thereby get collectively the best working conditions for the men, combined with the best heat treatment of the coal, each retort in the "Dempster-Toogood" system becomes the unit measure, and consequently each retort is separately heated, charged, discharged, and regulated for every function independently and separately. The gas-tight coal valve is vertically-faced, and is revolved completely, whereby it is self-



Condensers, Scrubbing Plant, Boiler House, and Steel Chimney.

cleaning. It admits coal for carbonization, and coke for filling the retorts after periods of scurfing, thereby relieving the men of the need for manual handling of coke to retorts. The coal bin acts as a reservoir and holds 8 cwt. of coal (2 hours of maximum demand, or 3 hours when steaming). As coke is extracted from the retort at the bottom, the coal gravitates in; hence this bin requires periodic replenishment *via* the coal valve. The bin is built so that the whole cross-section of the top of the retort, 40 in. by 8 in., is clear. The top mouthpiece is fitted with three poke-balls, thus giving great freedom of access for probing over the whole cross-section of the retort.

Coal passes into the retort on the centre of the major axis, forming a pyramid of coal always surmounting the slowly descending charge within the retort. This pyramid, by virtue of its being placed centrally, gives rise to a natural phenomenon which proves beneficial to the process. (1) The nuts on entering roll down each side of the pyramid, thereby (the process being continuous) setting up a balanced coal condition, and increasing the porosity of the charge resulting from a given coal. (2) The evolved gases rising through the charge are the more symmetrically divided, and pass to the right and left of the pyramid on their way to the off-take, thus inducing more intimate association of the hydrogen atmosphere and the valuable hydrocarbons issuing from the newly-entered coal. The gas off-take pipe is exceptionally large in cross-sectional area, and is fitted with a liquor dribble. Thus a large, cool, and inclined chamber is formed, through which the issuing crude gases are slowly led, whereby much of the mechanically suspended dust is immediately precipitated and returned to the retort to be carbonized among fresh tar vapours.

GAS EGRESS—CONTROL OF THE BENCH.

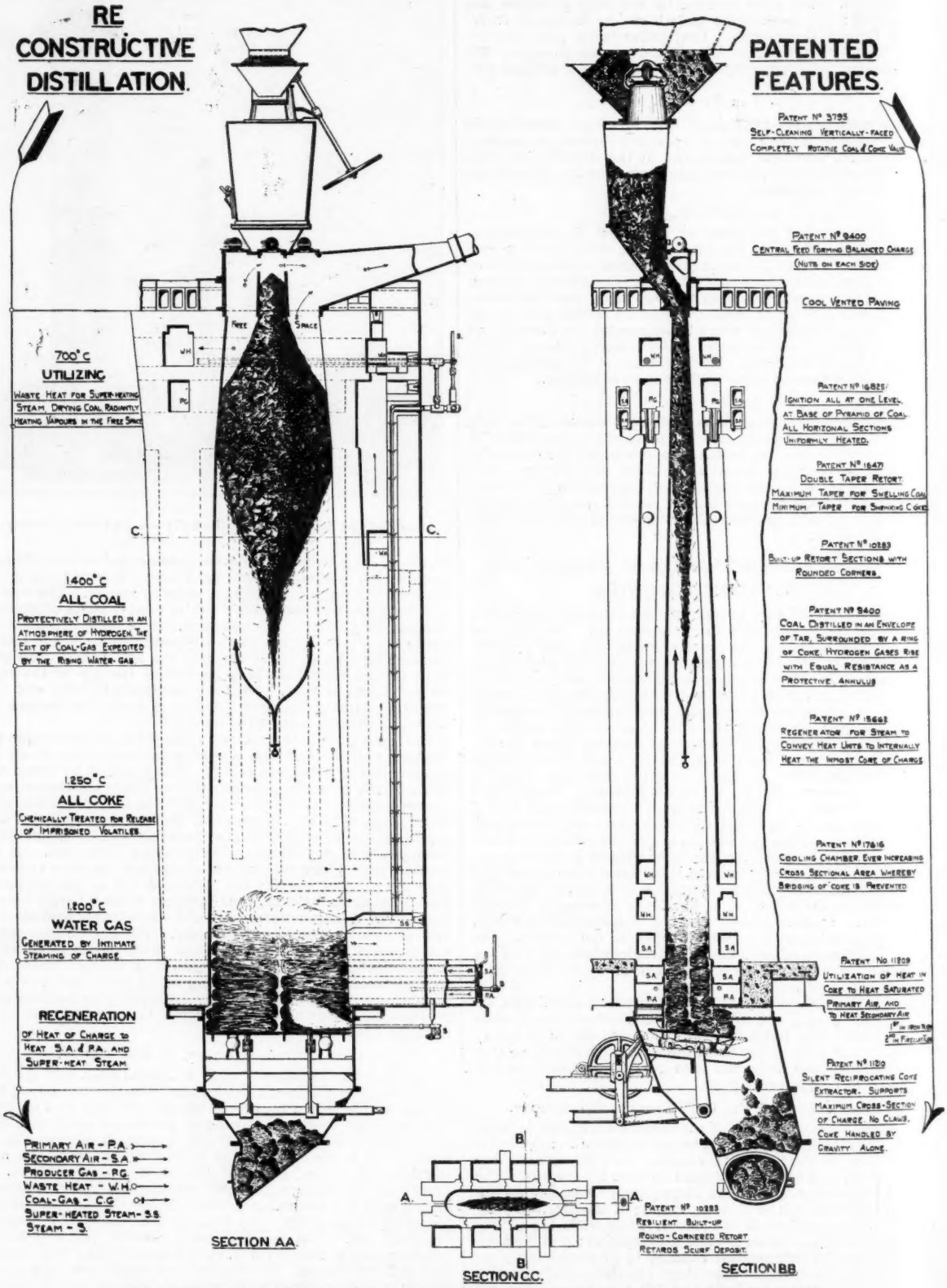
The open-luted hydraulic main is carried on a cool platform away from the hot bench brickwork. The seal can be adjusted to seal the dip pipe 2 in., or the liquor level may be 2 in. below the dip. The deep seal is used at periods of scurfing, a light seal after scurfing or until the gas is good, then gradually the liquor level is lowered till the interior of the hydraulic main is controlled at level gauge by the retort-house governors. In every case the issuing gases meet considerable liquor, to dissolve immediately any ammonium chloride before the crystals are protected by a coat of tar. Any thick tar can readily be removed at the open lute. The seal-regulating valve is 4-in. square, the overflow passing away by 6-in. tar pipes, well fitted with cleaning caps and tee flanges. Midway between each retort and its hydraulic is fitted a cleaning lid which permits of the off-take and hydraulic being simply augured at will. The exit pipe from

each hydraulic is furnished with an 8-in. Peet's valve to enable each retort to be shut off. A visible dribble of liquor is run into the inclined foul main adjacent to each retort, and, gravitating back to each hydraulic, maintains the inner surface of all mains wet, making easy working and cooling the gas.

The four retorts symmetrically surround the producer, and each producer has its own independent chimney, thus conserving radiated heat and sharing conducted heat and draught more equally. There are two 18-in. foul mains, and two 6-in. tar mains (one on each side of the bench). These unite at, or adjacent to, the governors.

The 10-in. retort-house governors are grouped at the bench top, where they are easily attended. They are in duplicate, and work in parallel, and maintain the hydraulics at as nearly level-gauge as practical. Each stands on a seal-pot, so that any thick tar which might be thrown down while the gases are passing the necessarily restricted governing passages can be readily removed. It is to be observed with continuous verticals that it is cool coke (the sensible heat of which has already been utilized, which is to the advantage of the men) charged to the producers. The process of charging is simply to remove the lid and permit the coke to gravitate from the overhead storage bunkers, there being in this system no manual handling whatever.

The top platform—a plate girder bracing the bench—gives a walking way completely round each bench. This platform gives easy access for adjusting the chimney dampers, and for inspecting the temperature of the extreme top of the retort. Further, as each retort is controlled by one damper only, it is at


RE
CONSTRUCTIVE
DISTILLATION.
700° C
UTILIZING
WASTE HEAT FOR SUPER-HEATING STEAM, DRYING COAL, RADIANTLY HEATING VAPOURS IN THE FREE SPACE
1400° C
ALL COAL
PROTECTIVELY DISTILLED IN AN ATMOSPHERE OF HYDROGEN. THE EXIT OF COAL-GAS EXPEDITED BY THE RISING WATER-GAS
1250° C
ALL COKE
CHEMICALLY TREATED FOR RELEASE OF IMPRISONED VOLATILES
1200° C
WATER GAS
GENERATED BY INTIMATE STEAMING OF CHARGE
REGENERATION
OF HEAT OF CHARGE TO HEAT S.A. & P.A. AND SUPER-HEAT STEAM
PRIMARY AIR - P.A.
SECONDARY AIR - S.A.
PRODUCER GAS - P.G.
WASTE HEAT - W.H.
COAL-GAS - C.G.
SUPER-HEATED STEAM - S.S.
STEAM - S.
FREE SPACE
SECTION AA.
SECTION CC.
PATENTED
FEATURES.
PATENT Nº 3795
SELF-CLEANING VERTICALLY-FACED COMPLETELY ROTATIVE COAL & COKE VALVE
PATENT Nº 9400
CENTRAL FEED FORMING BALANCED CHARGE (NUTS ON EACH SIDE)
COOL VENTED PAVING
PATENT Nº 16825/
IGNITION ALL AT ONE LEVEL, AT BASE OF PYRAMID OF COAL. ALL HORIZONTAL SECTIONS UNIFORMLY HEATED.
PATENT Nº 16471
DOUBLE TAPER RETORT
MAXIMUM TAPER FOR SWELLING COAL
MINIMUM TAPER FOR SHRINKING COKE
PATENT Nº 10283
BUILT-UP RETORT SECTIONS WITH ROUNDED CORNERS.
PATENT Nº 9400
COAL DISTILLED IN AN ENVELOPE OF TAR, SURROUNDED BY A RING OF COKE. HYDROGEN GASES RISE WITH EQUAL RESISTANCE AS A PROTECTIVE ANNULUS
PATENT Nº 15663
REGENERATOR FOR STEAM TO CONVEY HEAT UNITS TO INTERNALLY HEAT THE INMOST CORE OF CHARGE
PATENT Nº 17816
COOLING CHAMBER EVER INCREASING CROSS SECTIONAL AREA WHEREBY BRIDGING OF COKE IS PREVENTED
PATENT No 11209
UTILIZATION OF HEAT IN COKE TO HEAT SATURATED PRIMARY AIR, AND TO HEAT SECONDARY AIR
PATENT Nº 11210
SILENT RECIPROCATING COKE EXTRACTOR. SUPPORTS MAXIMUM CROSS-SECTION OF CHARGE. NO CLAWS. COKE HANDLED BY GRAVITY ALONE.
PATENT Nº 10283
RESILIENT BUILT-UP ROUND-CORNERED RETORT RETARDS SCURF DEPOSIT.
SECTION BB.

THE DEMPSTER-TOOGOOD SYSTEM OF CONTINUOUS VERTICAL RETORT CARBONIZATION.

this level, where the temperature is only about 700° to 800° C., that the main control damper is situated; and being arranged at eye level, the convenience of control is obvious. The lower platform similarly is a plate girder, bracing the bench, and likewise serves as a walking way. From it the combustion chambers or zone of maximum temperatures—viz., 1315° to 1350° C.—are inspected and measured by pyrometer. Furthermore, should adjustment between the right and left hand combustion chambers to any retort be required, the balancing dampers are at hand for ready control. The combustion chambers are fitted with glazed boxes to admit of seeing the internal conditions, without the need of disturbing delicate propagations of flame by opening and admitting the atmosphere or the atmospheric pressure. To conserve the combustion-chamber temperature against radiation losses, and to render the supervision of heats more comfortable, a 4½-in. course of special porous brick is built external to the bench walls. So efficient is this insulation that the hand can be placed on these external walls of the hottest portion of the setting.

The Producer and Mechanism Levels.

The producer floor is 15 ft. 6 in. above ground-level, and here are situated the eight producers. Each ashpan is furnished with a grid and ashes hopper, so that all shovel work is saved, the ashes accumulating in this hopper, until carted away at ground-level. Thus onerous demands on labour are reduced. The producers are fitted with patent non-clinkering screen bar grates. These grates consist of water-raced firebars, inclined at about 40°, grouped within vertical furnace linings, and terminating with a relatively narrow outlet to the ashpan. The feature of this construction is that a steeply-inclined screen is offered to every cob of incandescent coke, as a consequence of which, as the coke is consumed, a continual slip is maintained between the grate and the coke, whereby the ashes are screened out before they can become fluxed into clinker; also, agglomeration of coke is prevented. So effective is this action that the pan ash from these grates contains such a small percentage of usable coke as to warrant its being carted direct to the tip.

The mechanism platforms (7 ft. 6 in. above the ground) extend each side of the bench and give facilities for the attention of gear and adjustment of parts. The coke extractors are silent in working and are separately adjusted for each retort. Each retort heats its own secondary air. Two secondary-air slides are fitted per retort (one for each side of each retort), and are readily and finely adjusted from the mechanism platform. The steam services are at this level, and control cocks regulate steam to the primary air, to the furnace ashpan, and to the base of each retort for the steaming of its charge—usually at 20 to 40 lbs. pressure through 5/32 in. orifice.

Beneath the retorts are fitted cast-iron receptacles in which the cooled coke extracted from the retorts is allowed to accumulate, and whence it is discharged every 2 to 4 hours, depending on the vogue of steaming. During discharging, the coke is regulated from the receptacles to each bucket of the gravity-bucket conveyor by means of the rotary and travelling filler, all at the rate of 25 tons per hour. The conveyor carries the coke to the screens or to the storage bunkers over the retorts and furnaces.

General Features of the Installation.

A small steam pump, a high and a low level tank, connected through the services to foul mains, suffice to maintain steady flows of liquor throughout, the surplus liquor and tar overflowing to the gas-works underground storage tank. The refractories in the combustion chambers are protected by the sympathetic and intermediate disposition of the vital or active flame of ignition, so that the refractories most highly heated are subject to the minimum of weight, are relieved of the extremes of temperatures, of the erosive effect of the moisture in descending coal and rising steam, of the wear and tear of stokers' bars, and are more easily re-set (any re-setting being within the uppermost 9 ft. 6 in. of the retort), and are surmounted by a waste-heat flue, which dries the descending coal by regenerating the waste-heat. The bench-top ironwork is thereby rendered cool; whence the further advantages of comfort to the men, reduced stress on refractories, and prevention of formation of pitchy compounds.

The desiderata of coke extraction being sure and silent working and breeze prevention, the coke extractor consists of a smooth and inclined tray, having a stroke independently adjustable for each retort and also for each line of retorts. The egress for coke is 60 in. by 14 in., whence the largest formations of coke can traverse the tray side-by-side, as there are no claws or guiding vanes to constrain or break the coke. The charge rests on the tray at the natural angle of repose; and on the tray slowly receding some 4 in., the coke gravitates down. The two-fold motion engendered overcomes all tendency of the coke to bridge; and the even descent of the charge as a whole is maintained with the greatest automaticity and on an even keel. A thousand cubic feet of gas per twenty-four hours suffices to develop the necessary power, *via* a 4½ H.P. gas-engine. To combine the advantages of the rounded shape of moulded retorts with the resilient strength of built-up retorts, the specials are grooved and tongued, and span the stay walls, so that there is no joint, other than bed joints, unsupported by a wall.

COAL AND COKE HANDLING AT BIRMINGHAM.

[Contributed.]

The accompanying photographs taken at the Nechells Gas-Works of the Birmingham Corporation show interesting methods of dealing with coal and coke.

"Mitchell" Double Tippler Hoist.

The first photograph is of the Mitchell double tippler hoist for unloading the coal. About 1240 tons of coal a day are brought into the works from two lines of track, in railway wagons of all types and sizes up to 20-tons capacity. These are received on to the unloading plant illustrated. The wagons are hoisted and tipped into the central receiving hopper at the rate of one every 4 minutes. The hopper is of 120 tons capacity, and discharges through two motor-driven coal crushers into the feeders of the gravity-bucket conveyors and elevators which serve the overhead bunkers of the Woodall-Duckham vertical retort-house. The unloading plant is controlled electrically by one man, who merely presses a button in the control cabin to set the tippler hoist in action. The arrangement provides that the crushers, driving gear, and conveyor feeders are all above the ground, for easy access and attention. The hoisting motors and gears are housed on the upper platform of the hoist staging, while the two control cabins are on ground level against the rear legs of the framing.

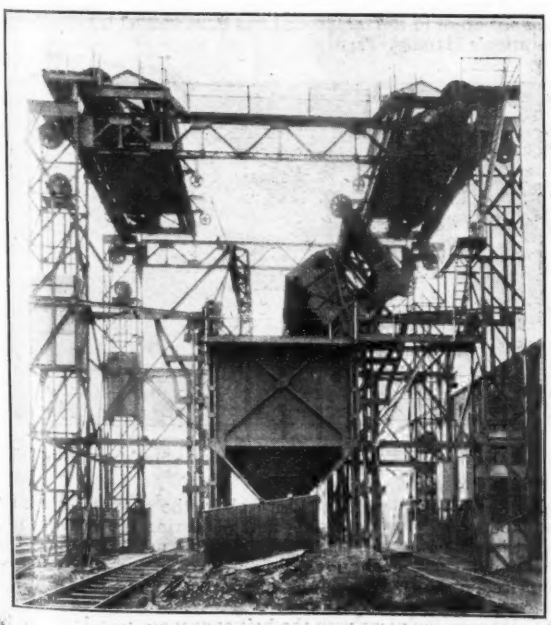


Fig. 1.—The Mitchell Double Tippler Hoist.

Coke Hoist and Traverser.

After carbonization of the coal in the verticals, the coke from the retorts (nearly 600 tons per day) is received into a number of specially-designed skips each of 3 tons capacity. As these are filled they are run along the floor of the retort-house on electrically-driven chassis into the open at the end of the house, where the traverser hoist lifts each skip and runs it out to discharge into one of the two receiving hoppers of the coke-screening plant. The next photograph gives a general view of this plant, with a skip just discharged into the second hopper.

Screening Plant.

The screening plant is in duplicate; each set of screens and delivery hoppers being served by its own overhead receiving hopper. From this hopper the coke is screened and graded into large, smalls, breeze, and dust. There are ten delivery hoppers, five on each side; and each grade is delivered into its own hoppers, from which it can be discharged into railway wagons or district carts. A bagging platform beneath these hoppers provides a convenient means of filling and storing coke in bags for the smaller retail trade. The next photograph shows this plant in the course of construction, with the traverser bridge above and a railway wagon filled under the second delivery hopper.

Screens and Distributing Belts.

Rotary screens are used with removable panels of wire meshing, instead of perforated plates. These give clean grading and a minimum of breakage. The first two screens take through reciprocating feeders from the two receiving hoppers, and deliver large coke into the underneath hoppers, or alternatively on to a 60-ton per hour belt conveyor, for distribution over the coke-stacking ground. They also deliver small coke, breeze, and dust into hoppers immediately underneath, alternatively by two shuttle-belt conveyors, either to the storage hoppers or for dis-

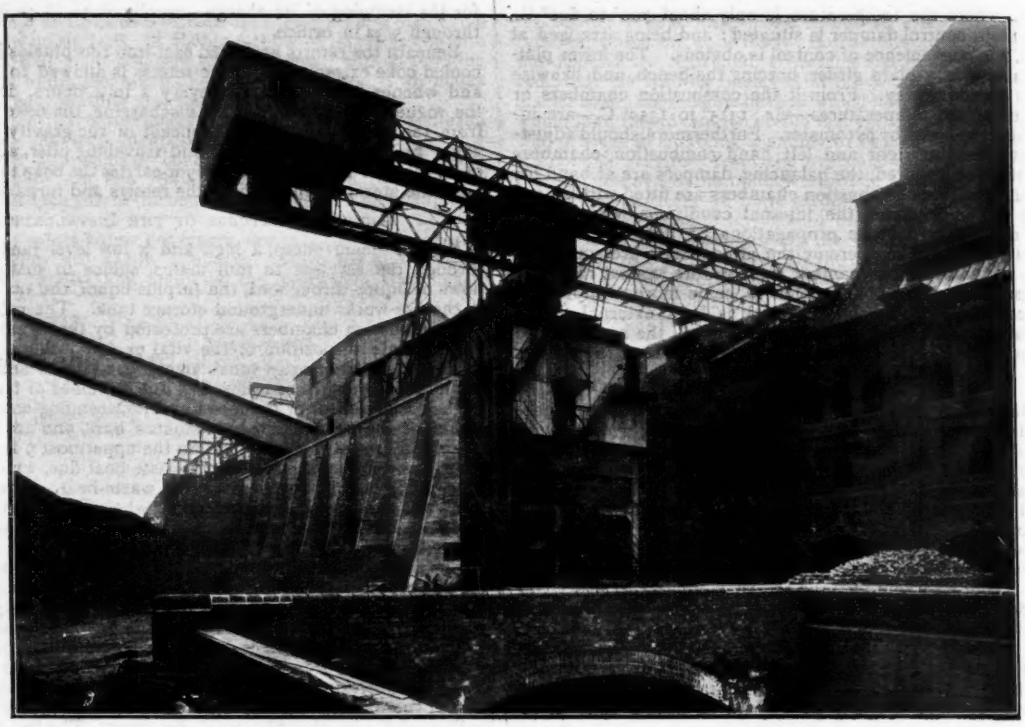


Fig. 2.—Screening Plant, with Traverser and Coke Skip.

tribution over the coke ground. They also discharge on to belts which deliver up the incline into two secondary screens for final separation into smalls, breeze, and dust. The next photograph

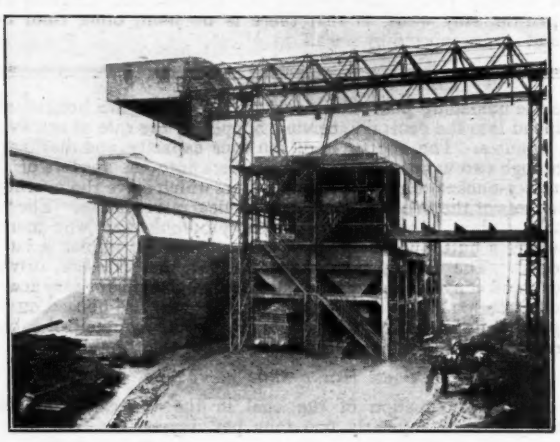


Fig. 3.—Screening Plant in Course of Construction.

shows the two 30-tons per hour belts for delivering into the two secondary screens, and the 60-tons per hour belt between them. From below the secondary screens a cross belt runs out and up

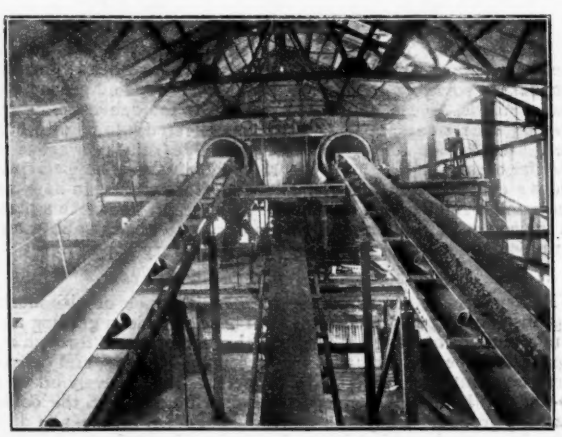


Fig. 4.—Belt Conveyors and Secondary Screens.

to the centre of the coke ground, over the length of which a shuttle belt 133 ft. long allows discharge at any point. At intervals chutes are arranged for starting the heap so that delivery can be made direct into barges which approach on the water, shown in the final photograph. On the left of the above plant, and 200 ft. away, is an earlier screening plant, which dealt with coke from the horizontal retorts. A belt conveyor is installed to connect this to the above screening plant so that it can act as an auxiliary if required. The belts and screens are driven independently by totally-enclosed electric motors.

Rubber Belts for Coke.

Rubber belts have long been in use for coal; but the above plant illustrates their successful use with coke. The belts are vulcanized in very long hydraulic presses, under both pressure and tension. Careful manufacture, together with correct methods of driving and guiding, secures a reliable and durable appliance; and the correct design of idlers and idler carriages is of the utmost importance. The above belts have been working for ten months; but belts similar to these, with capacities up to 60 tons an hour, are known which have been working with coke for ten years.

The last two photographs show the coke stacking ground, which is arranged for a storage of 10,000 tons, with the retaining wall behind separating it from the screening plant. The distributing belt structure in the foreground has been named locally the Corporation's Handley Page.

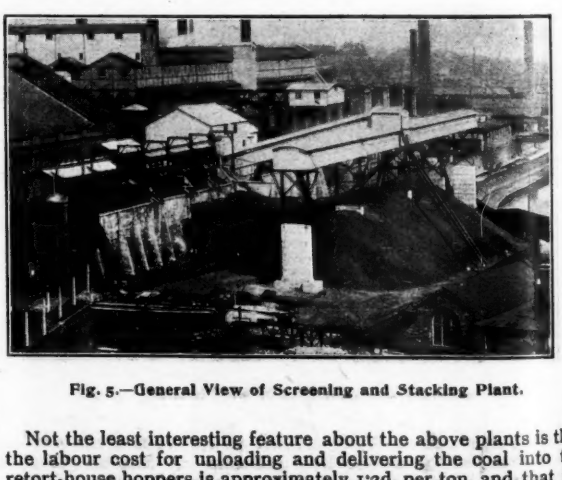


Fig. 5.—General View of Screening and Stacking Plant.

Not the least interesting feature about the above plants is that the labour cost for unloading and delivering the coal into the retort-house hoppers is approximately 1·2d. per ton, and that for dealing with approximately 600 tons of coke per day, screened, hoppered, and discharged, four men are required for two shifts, and three men for the third.

This screening plant with the belt conveyors was built by the Mitchell Conveyor and Transporter Company, to the order of

Messrs. Woodall-Duckham, who were responsible to the Corporation for the whole of the retort-house plant.

Fig. 6.—The Coke Plant from the Yard, showing "Handley-Page" Formation of Structure.

COKE SCREENING AT WINDSOR STREET.

At the Windsor Street Gas-Works there is a similar screening plant (built by the Mitchell Conveyor and Transporter Company in 1921) dealing with 700 tons of coke a day. Here similar revolving screens and rubber-belt conveyors have been running successfully for over a year and a half. Coke is received from the 3-ton skips of the coke cranes, and is screened and graded into a line of concrete hoppers, from which discharge is made direct into railway wagons or district carts. In this case, as one railway track is alongside the line of hoppers and not directly beneath, slightly inclined belts are used to deliver from the discharge valves of the hoppers into the wagons.

PRIVATE OXYGEN PLANTS.

THE problem of the production of cheap oxygen is of first-rate importance to the gas industry and its future development; and readers of the "JOURNAL" will welcome any further information which can be obtained on this fascinating and vital subject. On such a question it is but natural that we should be confronted with differing, and at times conflicting, views; but our aim is to deal fairly and impartially with the evidence brought forward, in the hope that publicity of knowledge gained will assist progress.

In the "JOURNAL" for June 20, p. 746, was published a communication from Mr. O. Simonis, the Managing Director of Liquid Air Limited, in which he stated that any individual consumer of oxygen, from (say) about 25,000 c.ft. per week upwards, can instal his own plant with substantial savings for himself, which are the greater the further he is removed from the nearest oxygen plant. Following upon this letter, an editorial in our contemporary "Industrial Gases" dealt with the production of oxygen in private plants, and expressed the view that, except in cases where the consumption of oxygen largely exceeds that of 25,000 c.ft. per week, a private plant is not an economical proposition [*vide* "JOURNAL" for Aug. 29, p. 634]. The editorial in question embodied a comparison of the cost of producing, by means of small plant, 25,000 c.ft. of oxygen per week, and the cost of the same quantity delivered from an oxygen factory fifty miles away.

It has been submitted to us that the comparison is valueless because it is based on the intermittent running of the small plant, the very reverse of sound economical procedure. The truth of the latter statement is, of course, well known to all interested in liquefaction processes; for, in starting up a liquefying plant of any description, a considerable expenditure of power is wasted before any output of liquid is possible. However, the main point about these figures is that they resulted in an invitation to visit the works of Liquid Air Limited, at Queen's Park, N.W. 6, for the purpose of discussing the production of oxygen in private plants.

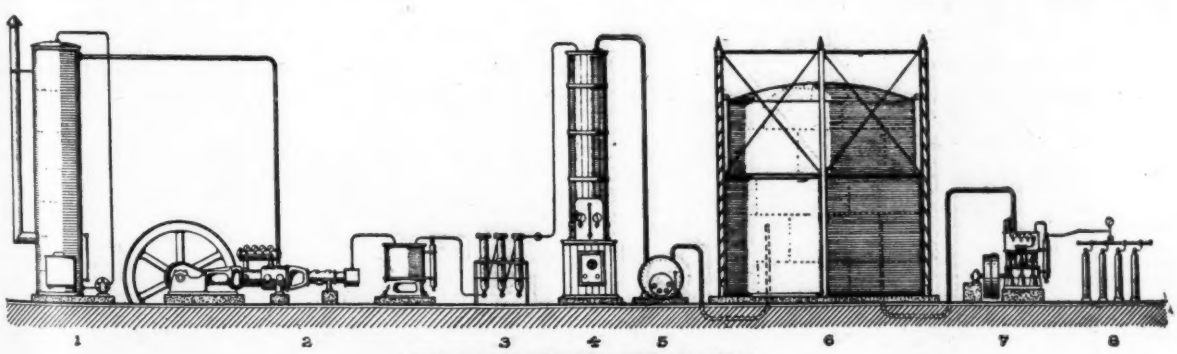
Before proceeding further, let it be stated that this firm is essentially a British manufacturing concern, as distinct from a German agency. Having made this clear, a description of the plant installed at the works will be of interest. This, for the sake of clarity and conciseness, is made in reference to the diagram of the process.

A quantity of air, relative to the capacity of the apparatus, is drawn in by the air-compressor (2) through the scrubber (1). The absorption of carbon dioxide from the air is effected during its passage through the scrubber; the absorbing agent being a solution of caustic soda flowing in opposition to the uprising air. [With larger plants the absorption of carbon dioxide is effected under pressure.] The air-compressors are generally of the horizontal type; but the tendency is to use vertical ones. In this plant, which has a capacity of 1000 c.ft. of oxygen per hour, a four-stage horizontal compressor is employed; and this compresses the purified air to 180 to 200 atmospheres. Once the state of equilibrium has been reached, the pressure is reduced to about 40 to 60 atmospheres, which is sufficient to replace the loss of cold in the separation column. After each stage, the air is led into a water-cooler, which absorbs the heat of compression. At high pressure, and reduced to the cooling-water temperature, the air then passes from the last stage of the compressor through an oil and water separator to a high-pressure drying battery (3). The latter contains caustic soda, which removes all traces of water vapour.

After the air has thus been purified and dried, it is conducted to the liquefying column (4). Here it is expanded at approximately atmospheric pressure; thus producing the low temperature necessary for liquefaction. The separation of the air into nitrogen and oxygen takes place in the rectifying column built upon the liquefier, and depends upon the different boiling-points of the two. The gaseous oxygen obtained in this manner leaves the separator with a percentage of purity of 97 to 99, and thereafter is conducted to a gasholder (6). For measuring the production, a gas-meter (5) is arranged between the separation column and the holder. If the oxygen is to be used at the place of production—as would be the case in a gas-works—it is possible to dispense with a filling station, and to conduct the gas through pipe-lines. In this plant, where oxygen is required in steel bottles, the gas is led into a compressor (7) of a suction capacity corresponding to the output of the plant, which compresses it to about 120 atmospheres.

Returning to the question of the future possibilities of small oxygen plants for gas production, it may be stated that, during the past two years, improvements in apparatus have resulted in a considerable lowering of the cost of production. The cost curve has therefore a downward slope; and as future development is usually based on past progress, and as the cost curve shows no sign of flattening out, there is at least no cause for undue pessimism, though many years may elapse before the Utopian figure of 1s. per 1000 c.ft. is reached.

In conclusion, let us consider the type of oxygen plant required for a gas-works producing 500 million c.ft. per annum—*i.e.*, 1,644,000 c.ft. a day. According to the paper on "Oxygen in Gas Production" by Mr. H. J. Hodsman and Prof. J. W. Cobb, read before the Institution of Gas Engineers three years ago, 180 c.ft. of oxygen would be required in complete gasification by oxygen and steam for every thousand cubic feet of gas made; consequently the oxygen required per day would be 90,000 c.ft., or 630,000 c.ft. per week. A plant for a weekly output of this nature would be twenty-five times the capacity of the one for which figures are given in the article in "Industrial Gases" referred to; and it is not by any means outside the bounds of possibility that further developments of private oxygen plants will enable oxygen to be produced at a reasonable cost from the gas manufacturer's point of view.



Diagrammatic Elevation of Oxygen Plant.

Ceramic Society Refractory Materials Section.—Arrangements have been made for the holding of the thirteenth meeting in the Grosvenor Museum, Chester, on Oct. 4 and 5, under the Presidency of Mr. J. Holland. Among the papers promised are one by Mr. R. Maclaurin on "New Methods of Producing Gas for Industrial Operations," and another on "The Effect of Salty Coal upon Refractory Materials," by Mr. L. M. Wilson, M.Sc.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

HALF-YEARLY MEETING AT TOTTENHAM AND HOLBORN.

A LARGE number of members took part in a long day's proceedings last Wednesday, comprising the autumn meeting of the Association. It was a thoroughly successful gathering in every way, and favoured by magnificent weather. The complete arrangements which had been made for the comfort of those attending were much appreciated; and the thanks to their hosts—the Tottenham District Light, Heat, and Power Company—which were voiced on all hands, were really heartfelt. "Nothing could have been better," was the unanimous verdict.

AT THE GAS-WORKS.

Assembling at Liverpool Street Station, the members found motor coaches awaiting them, in which they were conveyed to Willoughby Lane, for an inspection of the Tottenham works of the Tottenham District Light, Heat, and Power Company. Here they were received on the splendid recreation ground by Mr. Henry Woodall, J.P., M.Inst.C.E. (the Chairman of the Company), Mr. A. E. Broadberry (Director), and Mr. H. C. Smith (Engineer and Manager). No time was lost in arranging parties, who subsequently, under the guidance of Messrs. Warburton, Gardiner, Roach, and other members of the staff, covered as much of the huge site as was practicable within the short time that it was possible to devote to the tour. Great interest was evinced in the various new works now being carried out, the principal being the erection of a new gasholder by Messrs. Clayton, Son, & Co., Ltd. This is being built to the Tottenham Company's design and specification, and to the Company's own working drawings. It is a five-lift holder, in a brick tank. The outer lift is 244 ft. 4 in. in diameter, and all lifts are 38 ft. deep from the bottom of the curb to the top of the grip channel. There are twenty-four standards built-up in five lengths; the top piece being 40 ft. 5 in. long, and the others, 36 ft. 10 in. long. Each length is tapered to give a uniform batter to the outside when bolted together. These standards are connected by five tiers of girders. Diagonal ties are provided between each pair of girders. The crown of the holder is erected on steel framing supported by stanchions in the tank. The centre stanchion is about 45 ft. long. The inlet and outlet pipes are each 36 in. in diameter; and a Livesey seal is attached to the crown, and surrounds these. The holder is being connected with the valve house which exists on the present works site (about 2300 ft. away) through 36 in. diameter inlet and outlet pipes. The pipes are being laid now, and a subway through which they will run is in the course of construction under the L. & N. E. Railway. The total capacity of the holder when blowing is just over 7 million c.ft. The working capacity is 6¾ million c.ft. The quantity of water in the tank is 7,789,000 gallons. The pressures which will be thrown are:

Inner lift	4·23 in.
Second ,,	6·27 ,,
Third ,,	8·13⅜ ,,
Fourth ,,	9·92 ,,
Fifth ,,	11·6 ,,

The subway under the L. & N. E. Railway is being constructed of two main concrete walls 4 ft. 3 in. thick, surmounted by steel girders, between which brick arches will be sprung. The dimensions of the subway are: Length, 145 ft. 6 in.; breadth, 16 ft.; and depth, 10 ft.

In addition to the gasholder, a new sulphate plant, boiler-house, and tar dehydrating plant are being put down. One 5 to 7 ton per diem plant for the production of dry neutral sulphate of ammonia is on the point of erection by the Chemical Engineering & Wilton's Patent Furnace Company, Ltd. The house which is being built to accommodate this plant will finally contain an additional 5-ton plant, to be transferred from the old works. This building is arranged for extensions to cover a third plant, should it be required. There is also room left in the building to replace these two plants by 10-ton plants at a later date.

The sulphate store, which is included in the main building, will accommodate 500 to 600 tons of sulphate. A tar and liquor storage tank is being constructed in reinforced concrete. This tank will hold 75,000 gallons of liquor and 25,000 gallons of tar. In addition, there are three reinforced concrete settling tanks for effluent liquor. Each tank has been designed to hold 60,000 gallons.

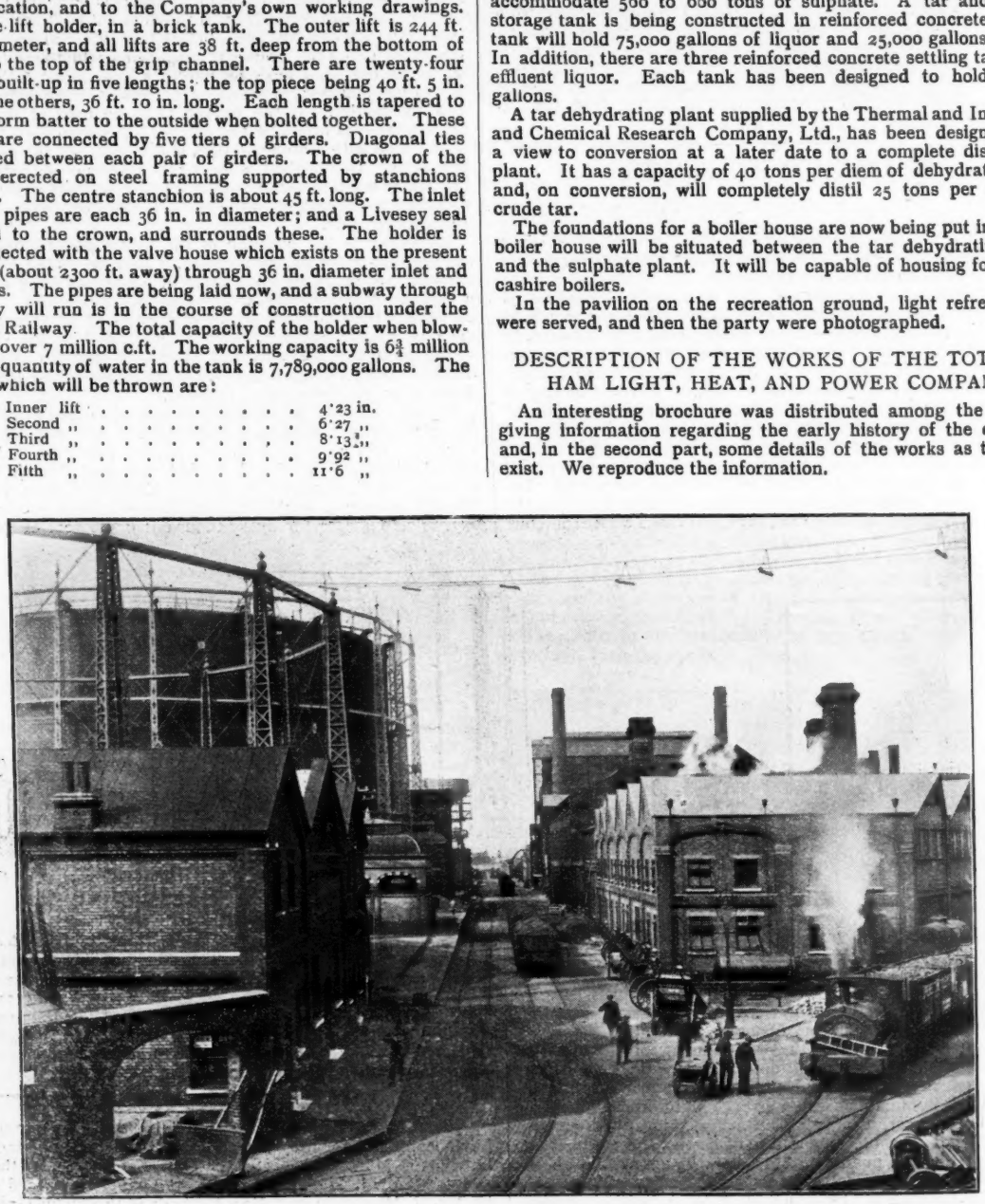
A tar dehydrating plant supplied by the Thermal and Industrial and Chemical Research Company, Ltd., has been designed with a view to conversion at a later date to a complete distillation plant. It has a capacity of 40 tons per diem of dehydrated tar; and, on conversion, will completely distil 25 tons per diem of crude tar.

The foundations for a boiler house are now being put in. This boiler house will be situated between the tar dehydrating plant and the sulphate plant. It will be capable of housing four Lancashire boilers.

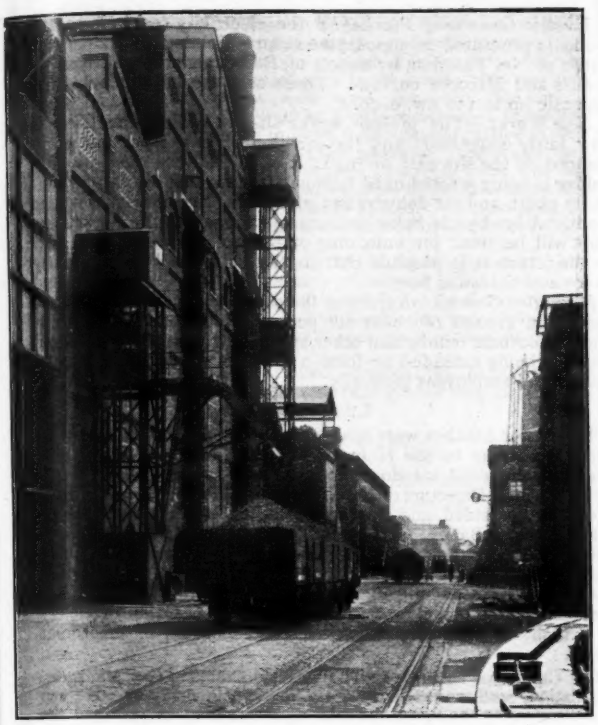
In the pavilion on the recreation ground, light refreshments were served, and then the party were photographed.

DESCRIPTION OF THE WORKS OF THE TOTTENHAM LIGHT, HEAT, AND POWER COMPANY.

An interesting brochure was distributed among the visitors, giving information regarding the early history of the concern; and, in the second part, some details of the works as they now exist. We reproduce the information.



GENERAL VIEW FROM THE MAIN ENTRANCE OF THE WORKS OF THE TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

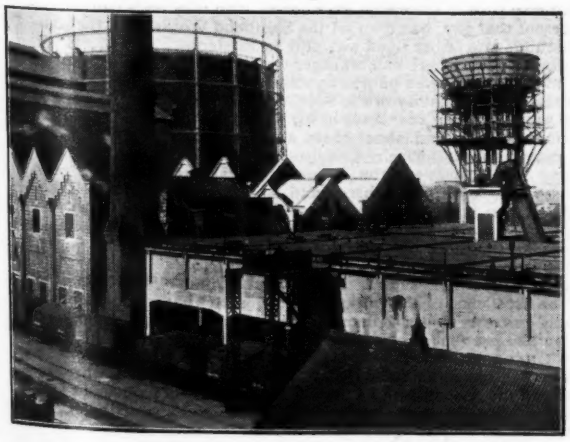


View from North End—Woodall-Duckham Verticals on the left.

HISTORICAL.

In 1845, Mr. Alexander Angus Croll, who was at that time Superintendent of the Brick Lane Works of the Chartered Gas Company, obtained a concession from the Imperial Gas Company to supply the districts of Tottenham and Edmonton (which then included Wood Green and Southgate). He procured for manufacturing purposes a site of barely 1¼ acres, now the extreme southern end of the works. The site seems to have been chosen because it was at that time a coal-yard, contiguous to the Eastern Counties Railway (now part of the London and North-Eastern Railway), and had a siding with unloading and storage pits—doubtless very good reasons at the time; but, being cut off from communication with the river by the railway, it restricted the coal supply to that available by rail. This is now rectified by the Company having procured the land on the opposite side as far as the river.

Mr. Croll, as is well known, was a pioneer in the gas industry, and at Tottenham he applied many of his inventions. The retort settings were of his duplicate type, as described in "King's Treatise"—viz., a setting of direct-fired clay retorts on a stage floor, and a setting of iron retorts below the stage, heated by the waste heat from the setting above. Ammonia was recovered by his system of washing the gas in water acidulated with sulphuric acid, which was subsequently boiled down and the sulphate of ammonia obtained. The original tanks were destroyed in 1911, having been used for years as water-tanks for coke-quenching. The purification of the gas was effected by oxide of iron, the use of which, for the purpose, was patented by him five years previously. The district having already been supplied from the London side by the Imperial Company, the mains had to be reversed to bring the larger ones near the new source of supply; and it affords an instance of the rapidity with which Mr. Croll worked to note that the job was completed in a little over twelve months, although he had much else in hand at the time.



Concrete Purifiers in foreground, and 60,000 Gallon Reinforced Concrete Water-Tower in course of erection.

In 1844, Mr. Croll had patented the dry gas-meter, of which he was joint inventor with William Richards; and at this time he and Mr. Thomas Glover founded the Clerkenwell meter business under the style of Croll and Glover. The following interesting letter to his partner—found among the papers of the latter in 1903, and presented to the Company by his grandson and namesake, Mr. Thomas Glover—outlines the formation of the Company.

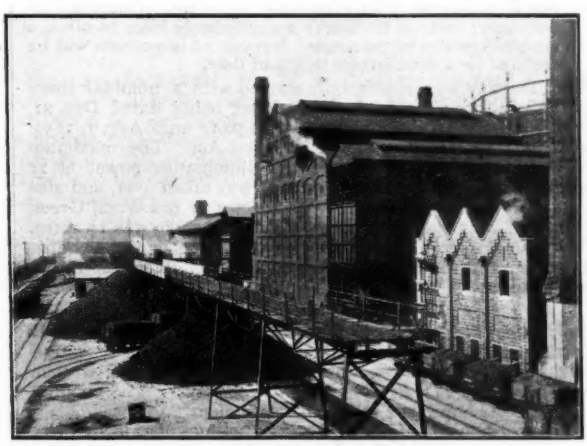
TOTTENHAM AND EDMONTON GAS-WORKS.

Pharos Lane, Marsh Lane.

These works stand upon nearly 2 acres of freehold land, are bounded on the south by the Eastern Counties Railway, and on the west and north by Willoughby and Dyson's Lanes. They consist of a retort-house—50 ft. long by 40 ft. broad, side walls 19 ft. high—capable of containing sixty retorts. There are at present erected ovens for forty retorts, one-half of which are filled, and in working order. Coal-store, within 20 yards of the railway, capable of containing a winter's stock, with gas-fitter's shop attached. Purifying-house, containing two sets of double purifiers, two saturators, an exhauster, and 2-horse steam-engine. Lime-room likewise containing the steam-boiler. Ammonia-room, with the necessary apparatus for making sulphate of ammonia. Store-room and blacksmith's shop. Two gasholders, each 32 ft. diameter by 17 ft. deep, set in cast-iron tanks. Condenser. Tar-well, sufficient to hold six months' stock. Two-stall stable and coach-house, with hay-loft above. Bath-room, with cold and warm baths, and necessary fittings. Greenhouse, stocked with plants. Superintendent's residence, consisting of two-storey four-roomed house, with kitchen and other offices. Counting-house of two large rooms.

Main pipes: 3310 yards of 2 in. diameter; 5615 yards of 3 in. diameter; 36 yards of 4 in. diameter; 153 yards of 5 in. diameter; 5032 yards of 6 in. diameter; 1016 yards of 7 in. diameter; 2030 yards of service-pipe—making a total of nearly 10 miles in length.

The above are at present the property and in possession of A. A. Croll, by whom they were erected, and intended by him as a permanent investment, and were on that account built of the best materials,



East Side of the Works. Right [to left—No. 3 Boiler House, Verticals' Coke-Screening Plant, Vertical Retort-House, Horizontals' Coke-Screening Plant, No. 2. Horizontal House.

in the most substantial manner, and in strict accordance with the Building Act.

There are two main pipes leaving the works—one proceeding along Willoughby and Marsh Lanes; the other going up Dyson and Water Lanes.

A direct communication between the united villages of Tottenham and Edmonton could have been formed by going up Waggon-and-Horses Lane, and at one-third the expense; but the route taken was considered best from the fact that it thus embraced the coach road leading to the two stations of railway—Marsh Lane and Edmonton, both of which will, in all probability, be built upon in a short time.

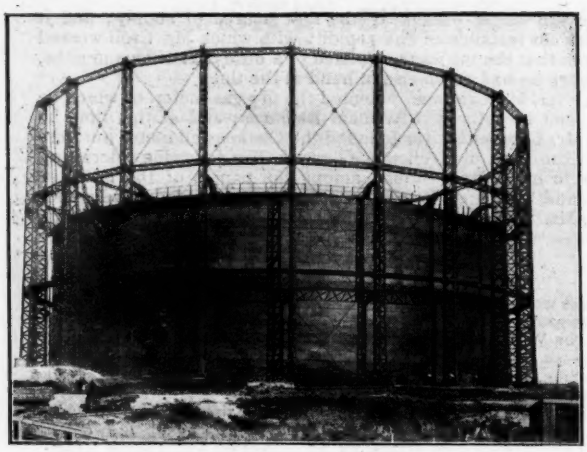
The works are supplied by an artesian spring, which flows to a height of 8 ft., and is carried in pipes all over the works, so that no manual labour in pumping is required.

The whole of the spare land is in a good state of cultivation, and tastefully laid out in grass lawns, flower-plots, and gardens, to be appropriated to the further extensions of the works. A beautiful fountain and pond stands opposite the Superintendent's house, and fronting the gate of the works. This is supplied with a constant stream of water from the artesian spring.

It is proposed to form a Company for the purchase and carrying on of the above works, with a nominal capital of twenty thousand pounds (£20,000), in 1000 shares of twenty pounds each—one hundred of such shares to be reserved to A. A. Croll.

The Company to pay to A. A. Croll, on their taking possession of the works, the sum of [sum not stated in letter]; the remainder of the purchase money to depend upon the amount of profit realized during the first twelve months of the Company's proceedings, and to be calculated upon the following principle:

The whole of the expenditure included in the following items: Coals, wages, salaries, lime, wear and tear of retorts, taxes,



The New 6¾-Million Holder in course of erection—Two Tiers of Column Sections yet to come.

general expenses, ½ p.ct. for bad debts, acid, deterioration fund 1 p.ct., gas-fittings purchased.

The above to be deducted from the gross income by: Gas, coke, breeze, tar, ammonia, gas-fittings sold, old materials. And for every £60 of profit shown by the balancing of these accounts, the Company pay to A. A. Croll the sum of one thousand pounds; or, in other words, the Company shall have secured to them 6 p.ct. upon the amount to be paid for the works.

If this amount is secured to the Company for the first year, it is fair to presume that it will go on increasing every year, for two reasons: The villages of Tottenham and Edmonton, previous to the erection of these works, were never properly attended to as to lighting, and, in consequence, there is a general desire for gas, including the private dwellings of the most respectable inhabitants; and, as the works are sufficiently large to allow a double extension of the present demand, no investment will be required for a considerable length of time.

The Company was successfully started with a nominal share capital of £25,000; the deed of settlement being dated Dec. 21, 1847. It existed as a non-statutory company until Aug. 1, 1859, when Royal Assent was given to the first Act. The maximum price of gas was fixed at 6s., and the illuminating power at 11 candles. In 1914 the Enfield Company was taken over, and also powers were obtained to supply electricity in the Wood Green district. In 1845 the area occupied by the works was 1½ acres. Including the Ponders End Works, the area now occupied amounts to 25 acres; and the Company has 80 acres available for future development.

DETAILS OF THE PLANT.

Carbonizing Plant.—No. 1 retort-house contains eighteen beds of 22 in. by 16 in. by 20 ft. retorts set in beds of eights. These retorts are operated by a Fiddes-Aldridge machine, the coke being removed by a De Brouwer hot-coke conveyor. The nominal capacity of this house is 2 million c.ft. per diem.

No. 2 retort-house contains twenty-four settings of 22 in. by 16 in. by 20 ft. retorts set in beds of tens. These retorts are charged and discharged by De Brouwer projectors and pushers. The coke is removed by a De Brouwer hot-coke conveyor. The nominal capacity of this house is 4 million c.ft. per diem.

In both Nos. 1 and 2 retort-houses, the hot-coke conveyor also acts as an elevator, and discharges coke on to the coke screens.

The coke-screening plant of No. 1 retort-house was put to work at the end of July, and is believed to be the only example of its kind at present working in this country. It is a very well-balanced screen; the vibration caused by it, when at work, being practically *nil*.

No. 3 retort-house contains 56 Woodall-Duckham vertical retorts, having a nominal throughput of 6½ tons per diem. These retorts are heated by means of gas generated in "Tees" producers, with mechanical grates. A portion of the waste heat from the vertical settings is recovered and used for the generation of steam in waste-heat boilers. The coal and coke are handled in this house mainly by gravity bucket conveyors. The house has a nominal capacity of 4½ million c.ft. per diem.

Water-Gas Plant.—This was first put into operation in 1894. At that time Beckton was the only works in England using the system. The plant now consists of three sets each having a nominal capacity of 1½ million c.ft. per diem, and two sets of 1 million c.ft. per diem.

Purifying Plant.—The condensing and scrubbing plant is on more or less orthodox lines. With regard to the condensing plant, it has been found advantageous not to depend on water alone, but on a combination of air-cooled and water-cooled condensers. The gas from the two horizontal retort-houses mixes at the inlet to the condensers. The ammonia washing plant for this gas consists of Livesey washers and rotary scrubbers. The purifiers are of the dry-lute type.

The vertical section exhausting plant consists of two 4½ million per diem B.T.H. turbo-exhausters, steam turbine driven. The gas is scrubbed by means of Livesey washers and vertical centrifugal scrubbers. The purifiers are ferro-concrete.

Electric Generating Plant.—All the electricity required on the works is generated in the engine-room adjoining the exhauster-house of No. 3 section, by means of E.C.C. generators driven by Belliss and Morcom engines. These sets are in duplicate, and generate up to 150 KW. each.

New Works.—The present works site in Willoughby Lane is now fairly congested; and the erection of new plant has commenced on the site east of the L. & N. E. Railway. A new gas-holder is being erected of 6¾ million c.ft. capacity, also a new sulphate plant, and tar dehydration plant with the necessary boiler plant. A lay-bye is being constructed alongside the River Lee. This will be used for unloading oil-barges and for loading tar. In the future it is possible that coal will also be brought up by barge and unloaded here.

Recreation Ground.—Adjoining the south end of the works is a recreation ground of about six acres. This ground is used for cricket, football, tennis, and other sports. It contains a pavilion, which is being extended to form a clubroom for the use of the Company's employees generally.

LUNCHEON.

The motor coaches were again requisitioned to take the visitors from the works to the Holborn Restaurant, where a party of about one hundred sat down to luncheon as the guests of the Chairman and Directors of the Tottenham Company. Mr. HENRY WOODALL presided, and was supported by Messrs. A. E. Broadberry, Henry Bailey, G. Hay Morgan, K.C., B.Sc., and W. A. Surridge (Directors). Among numerous visitors were noted Messrs. W. T. Dunn (Institution of Gas Engineers), E. J. Fottrell (National Gas Council), F. W. Goodenough and W. M. Mason (British Commercial Gas Association), and A. L. Griffith (Society of British Gas Industries). After the honouring of the Loyal Toast,

The CHAIRMAN submitted "The Eastern Counties Gas Managers' Association," and expressed his great pleasure in doing so. He and his colleagues on the Board, he said, were very glad to have had the members at the works that day, and to have met them afterwards at luncheon. To him it was a special gratification, because he had the privilege of knowing a number of the members, and possessed the most happy recollections of the many kindnesses and courtesies which he had received at their hands. The members had seen the Company's works that day, and had seen them in a condition which, he thought, they as engineers would appreciate more than if they had waited until the completion of the alterations. They had been able thus to understand some of the difficulties which had had to be contended with in connection with the work going on. Most of the work they had seen, of course, was to the credit of the Company's friend, and the Association's friend, Mr. Broadberry; but there was a great deal of work now being carried out which would fully tax the energy and ability of their friend Mr. Smith, of the possession of which he had already given proof. Meeting at different works in this way was a very good thing for all of them; and he hoped they would not feel that the day had been wasted. The Association was an excellent one.

Mr. T. F. CANNING, in response, thanked the Chairman for his kind words regarding the Association. It was, he remarked, to such gentlemen as Mr. Woodall that they were indebted for being able to hold these meetings. Without the support of the leading men of the industry, he feared they would fare very badly indeed. With his reply to the toast, he wished to combine a vote of thanks to the Chairman and Directors of the Tottenham Company, and to Mr. H. C. Smith, their able Engineer, and his assistants, for the cordial manner in which they had received the Association that day, and to the Company for the generous hospitality extended to them. He felt certain they would all agree with him when he said that nothing more could have been done for the comfort of the visitors. They had seen a very fine and modern works. He said this advisedly, because they were modern works to-day, with everything brought up to date. The Tottenham works were among the finest in the kingdom. They were in every respect model works; and the greatest possible credit was due to Mr. Broadberry, who had been associated with the Company for so many years, and to their present efficient engineer, Mr. Smith. They would have all liked to spend a much longer time on the works. It afforded him particular pleasure to propose this vote of thanks, because there were several old associations between Southend and Tottenham. Mr. Broadberry (one of their Past Presidents), who they were delighted to see present that day, was born on the Southend Works; and the house in which his late father lived was still in existence. Mr. W. H. H. Broadberry (the father) was Manager to the Southend Gas Company from 1855 to 1874, when he was appointed Engineer and Manager at Tottenham. The history of the Southend Company was one of continued success during the whole of his period of management. The Tottenham Works had about them an atmosphere of efficiency and good management. Much thought had been bestowed upon the planning of the works and the design of apparatus, for which great credit was due to Mr. Broadberry and Mr. Smith. To Mr. Henry Woodall—who bore a highly honoured name in the gas industry—they owed a deep debt of gratitude, not only for all he had done on the present occasion, but also for the arrangements in connection with the enjoyable meeting in Norwich a year ago.

Mr. E. F. KEABLE supported the vote of thanks, and remarked upon the excellence of the works they had seen that day, and upon the rapid progress that was being made by the Tottenham Company. The day had been most enjoyable in every way.

The CHAIRMAN, in acknowledgment, said that in those cases in which he had happened to be the Chairman of Companies who had entertained the Association, he had really been acting on behalf of his colleagues. He had very much at heart the welfare of the whole gas industry, as well as of the Eastern Counties Association.

Mr. G. HAY MORGAN proposed "The Visitors" who had been invited to meet the Association that day. They were all, he remarked, engaged in the direction of a great industry, and one which he believed was destined to fill a much larger place in this country in the future

than it had done hitherto. Those connected with it were serving their day and their generation in a lofty manner indeed. He was glad that they had had an opportunity of seeing what was being done at Tottenham, and what they expected to do in the future; and they must come again when the various works were completed. He saw no reason why a gas-works—utilitarian as it was—should not be a thing of beauty; and they should try to make their works attractive as well as useful. Proud as they were of their works at Tottenham, they were prouder still of their men—from their Chairman (who was one of the greatest authorities on gas-making) down to the least important employee. They had a really good body of men. In conclusion, he referred to the excellent work being accomplished by the British Commercial Gas Association.

The toast was responded to first by Mr. F. W. GOODENOUGH, who said he was glad to remember the early connection of the Tottenham Company with the "B.C.G.A.," and to think that the Company were still pleased with the work done. The Association were doing their best to secure for the industry that larger place in the country to which Mr. Morgan had referred.

Mr. W. M. MASON, who also replied, remarked that he was glad to be a guest there, because all that was broadminded was to be found in the Tottenham policy.

THE BUSINESS MEETING.

The business meeting was afterwards held in another room at the Holborn Restaurant. Mr. T. F. CANNING, of Southend-on-Sea (the retiring President), occupied the Chair at the outset, and was later succeeded by Mr. E. F. KEABLE, of Gorleston and Southtown (the new President).

MINUTES OF LAST MEETING.

The minutes of the last meeting were taken as read, and confirmed.

THE LATE MR. J. DAVIS.

Mr. CANNING said they had recently lost a very able member of the Association in the person of Mr. Joseph Davis, of Gravesend. The Committee had sent Mrs. Davis a letter of condolence, which had been acknowleged. The loss was a great one to the Association, whom he had served well in several capacities—having been President, as well as Secretary and Treasurer.

The members rose silently in their places, as a token of sympathy.

NEW MEMBERS.

On the proposition of Mr. J. H. TROUGHTON (Newmarket), seconded by Mr. E. SHADBOLT (Grantham), the following new members were elected: Mr. A. G. Gazely, Gas-Works, Woodhall Spa; and Mr. P. R. Huggett, Gas-Works, Brightlingsea.

THE NEW PRESIDENT.

Mr. CANNING remarked that the time had now arrived for him to retire from the Presidential Chair; and in doing so, he would like to thank the members very heartily indeed for the support they had invariably accorded him during his year of office. He also desired to acknowledge the great assistance rendered by the Committee and by the Hon. Secretary. Mr. Mainwaring was the right-hand man of the President. Only those who had occupied the chair could appreciate how much hard work the Secretary did. The next duty he (Mr. Canning) had to perform was a very pleasant one—to induct the new President, Mr. Keable. No words were needed to introduce Mr. Keable to the meeting. They were all aware of the value of his work. He had known him for some years, and had formed a very high idea of his commercial and technical ability. In Mr. Keable as President, they would have a man who would carry on the work of the Association in the best possible manner. He wished him a very happy year of office.

THE PAST-PRESIDENT'S MEDAL.

Mr. E. F. KEABLE (who was greeted with hearty applause) then took the chair, and thanked the members for the honour they had done him in electing him President. Many men could fill the chair very much more worthily than he could; but no one had the welfare of the industry more at heart than he had. He trusted that during his year of office he might uphold the traditions of the Association and of the industry. He would like to take this opportunity of making an appeal to the younger members of the profession to do everything in their power to increase the prestige of the industry. He felt that the industry had allowed itself to get somewhat into the background. On behalf of the Secretary, he would also ask the younger members to come forward with papers. Seeing that they had no Junior Association in the Eastern Counties, he hoped this appeal would be taken to heart by the young men. Now he had much pleasure in presenting to Mr. Canning, on behalf of the Association, the Past-President's Medal, as a token of their thanks to him for the services he had rendered to the Association and to the industry at large. He asked Mr. Canning to accept the medal with their best wishes for his future.

Mr. CANNING, in returning thanks, said he would carry away with him many happy recollections of his year of office.

PAPERS READ.

The following papers were then read, and, with reports of the discussions, will be found on pp. 860-9.

"Notes on Works Costs," by Mr. H. C. Smith, Chief Engineer of the Tottenham District Light, Heat, and Power Company.

"Light, Heat, and Power—A Plea for a Broader Outlook," by Mr. J. R. Bradshaw, B.Sc.(Eng.), Engineer and Manager of the Retford Corporation Gas Department.

Mr. J. W. AUCHTERLONIE (Cambridge), proposing a hearty vote of thanks to the authors, said it was becoming increasingly difficult to get members to come forward, and he must congratulate the Committee on securing two such excellent contributions as had been submitted that day.

Mr. T. A. GUYATT (Ely), in seconding, remarked that the subjects were both on new lines so far as the Association were concerned, and they were much indebted to the authors.

The vote was cordially passed.

PLACE OF NEXT MEETING.

The PRESIDENT said he was pleased to tell them that his Chairman had authorized him to invite the Association to Gorleston for the Spring Meeting; and he himself would be very pleased if they could see their way to accept the invitation.

This was agreed to.

NATIONAL GAS EXHIBITION.

The PRESIDENT went on to say that he had been asked to draw special attention to the National Gas Exhibition about to be held in Birmingham, and to urge the members to attend and support the Exhibition. Particularly he would point out the fact that there had been arranged a joint meeting of Commercial Sections on Oct. 1, at which their Association would be represented. A discussion would be opened by a member of the Eastern Counties on that occasion.

THE EDUCATION SCHEME.

The PRESIDENT next announced that a letter had been received from Mr. Walter T. Dunn urging the Association to support in every way the new Education Scheme. The difficulty the Committee felt in dealing with this matter arose from the awkward district they had to contend with, and the fact that they did not see how the members of their staffs could get to any particular centre. They had had further communications on this matter, and found that at the present moment no centres had been decided upon. All they could say, therefore, at this juncture was that, if the facilities were given, they as an Association would doubtless do all they could to support the scheme, of which he thought they were all in favour.

DISTRICT ASSOCIATION REPORTS.

The HON. SECRETARY (Mr. W. H. Mainwaring) read a letter from Mr. W. Rogerson, the Secretary of the Manchester District Institution of Gas Engineers, who, he said, had been in correspondence with Messrs. Walter King, Ltd., and had obtained from the proprietors of the "GAS JOURNAL" a basis of cost of re-introducing the combined volume of Reports of District Association Proceedings.

It was decided that the members of the Association should be circularized, so as to ascertain how many would be prepared to support the scheme by subscribing for copies of the volume on the terms proposed.

RETIRING OFFICERS.

The retiring officers were heartily thanked for their services, on the proposition of Mr. W. W. TOWNSEND (Colchester), seconded by Mr. A. E. BROADBERRY.

Before separating, the members took tea together.

New Motor Fuel.—The Australian Commonwealth Government are manifesting great interest in experiments with eucalyptus oil as a motor fuel. Mr. C. M. Dyer is said to have demonstrated that it can be used in petrol engines, with efficient means of vaporization. The only difficulty he has encountered is that it will not start an engine from cold without priming; but its calorific value is high. Tests made with cheap cars showed 24 miles to the gallon with gasoline; 28 miles with half gasoline and half eucalyptus oil; and 36 miles on eucalyptus oil alone. Eucalyptus oil mixes with gasoline, benzene, and alcohol, and acts as a decarbonizing agent.

Corrosion of Monel Metal Calorimeter Bombs.—In a paper to the Gas and Fuel Section of the American Chemical Society, Messrs. Geniesse and Soop state that a study of the heat effect of corrosion of the monel metal combustion bomb showed that coals having sulphur contents varying from 1·76 p.ct. to 5·76 p.ct. gave errors running from 0·50 p.ct. to 1·75 p ct. If the bomb washings are titrated for free acid, and if it is assumed that the rest of the sulphur unites with the bomb to form nickel and copper sulphates, the errors may be reduced to less than 0·3 p.ct. The errors were determined by comparing a monel-metal bomb with a gold-lined bomb, and by analyzing the bomb washings for copper and nickel.

Clegg's Work on Coal Gas.—Referring to gas history, the "Gas Age-Record" says that those who are so fortunate as to possess a copy of "A Practical Treatise of the Manufacture and Distribution of Coal-Gas," by Samuel Clegg, will be interested in the details about early coal-gas developments. The first edition of this splendid quarto was dated 1841, and was followed by the second in 1853, and the third in 1859, before which time the author had died, and the work was materially enlarged and revised by an editor. This treatise on gas manufacture compares very favourably with more recent efforts along this line, and should be an inspiration to present-day writers to make more of their subject, as well as to dress it up generously and with elegance.

NOTES ON WORKS COST.

By Mr. H. C SMITH, of the Tottenham District Light, Heat, and Power Company.

[A Paper Read before the Eastern Counties Gas Managers' Association on Sept. 12.]

The present-day high cost of materials and other charges, which, no doubt, are in many cases quite justifiable, render the question of repairs and maintenance a more important one than ever. No one, I imagine, would care again to leave undone the things that ought to be done, as so many were compelled during the war; and it is more imperative now than ever that money should be laid out to the best advantage. This must be my apology for taking up your time with what may appear to be a very dry subject; but I can assure members who have not had the opportunity, that a study of the detailed costs of the various jobs incidental to the manufacture of gas is a most interesting one, and one which will amply repay them.

CHOICE OF A COSTING SYSTEM.

A most important step towards economy in manufacture and maintenance is the establishment of a simple and effective costing system. It has always been necessary to know the cost of certain items of manufacture (for instance, for balance-sheet purposes), or at any rate to be able to give a figure for them; but in many cases the costs so ascertained, or the figures so given, have been very approximate. The post-war costs of labour and materials emphasize the necessity of every man's time being occupied in the most profitable manner, and of materials being used efficiently and without waste. In attaining this end, a costing system of some sort or other, more or less elaborate, is of great assistance; and here, at the very outset, lies one of the greatest difficulties, the choice of the right system—what degree of accuracy is required, and to how minute a detail the system should apply? The prospect of knowing the actual cost of conducting the various processes of manufacture and maintenance is a fascinating one, and is apt to lead the unwary into a net of over-elaboration. The writer has heard of systems that attempt to do far too much, and become so involved and expensive to manipulate that the cost of running them outweighs any saving that may possibly be effected by their use. In addition, the information required is not available until some weeks after it might have been with a simpler system. What are then the points to aim at in deciding the system to be adopted? It should be: (1) Simple; (2) accurate; and (3) elastic. By saying that it should be elastic, is meant that it should be capable of expansion and extension to meet growing conditions.

A short description of a system which has been found to answer these three conditions is given, in the hope that it may be found useful to some of those members who have not so far adopted some system or other. It has been working now for over two years at Tottenham, and has proved of great value in many ways. The basis of the system is—

THE COST NUMBER BOOK.

This is illustrated in figs. 1 and 2. The numbers shown in fig. 1 refer to repairs, and those in fig. 2 to manufacture.

Looking first at fig. 1, this applies to our vertical-retort section.

Cost No.	No. 3 Section.	Cost No.	No. 3 Section.	Cost No.	No. 3 Section.	Cost No.	No. 3 Section.
200	North bench.	221	No. 3 producer.	252		282	
201	South bench.	222	No. 4 producer.	253		283	
202	Hydraulic mains, foul mains, governors, gauges, tar towers, tar and liquor services and tanks, steam, hydraulic and water services.	223		254		284	
		224		255		285	
		225		256	Switchboard.	286	
		226	Ash hoist.	257	Condenser motors.	287	
		227		258	Circulating pumps.	288	
		228		259		289	
		229		260		290	
203	Extractor engines, &c.	230		261	Tar and liquor circulating pumps, mains and services.	291	
204	Stokers' tools, &c.	231				292	
205	North-side rotary coke filler.	232				293	
		233		262	Hot and cold wells and cooling tower.	294	
206	South-side rotary coke filler.	234				295	
		235		263		296	
207	North-side coal crusher and tipper.	236		264		297	
		237		265		298	
208	South-side coal crusher and tipper.	238		266		299	
		239		267		300	
209	North-side G.B. conveyor.	240		268		301	
		241		269		302	
210	South-side G.B. conveyor.	242		270	G.B. elevator boiler fuel.	303	
		243		271	East waste-heat boiler.	304	
211	Cross conveyor.	244		272	West waste-heat boiler.	305	
212	North coke screens.	245		273		306	Station-meter and connections.
213	South coke screens.	246		274			
214	Tipping tray conveyor.	247		275		307	
215		248		276		308	
216		249	Circulating water pumps.	277		309	
217				278		310	
218		250	East turbo exhauster set and connections.	279		311	
219	No. 1 producer.			280		312	
220	No. 2 producer.	251		281		313	

FIG. 1.

Cost No.	No. 1 Section.	Cost No.	No. 2 Section	Cost No.	No. 3 Section.	Cost No.	C.W.G.
700	Carbonizing (includes machine men, firemen, lidmen, scurfers, and tar-tower attendants, and one-third No. 1 boilermen and one-half No. 2 exhauster men).	720	Carbonizing (includes machine men, firemen, lidmen, scurfers, and tar-tower attendants and one-half No. 2 boilermen and one-half No. 2 exhauster men).	730	Carbonizing (includes top and bottom men, men on producers, men on tar seals, scurfers, one-half No. 3 boilermen and one-half No. 3 exhauster men and boys).	750	Manufacture (includes makers' assistants, one-half W.G. boilers, blower-house boys, coke raising, and all engaged on manufacture and not repairs).
701	Coal unloading.	721	Coal unloading.			751	Purifying.
702	Coke loading (includes men on gantry, men actually loading coke, boys on piecework).	722	Coke loading.	731	Coal unloading (includes one-half conveyor man and one-half greaser).	752	Unloading oil.
		723					
		724		732	Coke loading (includes one-half conveyor man and one-half greaser).		
703		725	Purifying.				
704	Purifying.	726					
705		727		733			
706		728		734			
707		729		735			
708				736			
709				737			
710				738			
711				739			
712				740			
713				741			
714				742			
715				743			
716				744			
717				745	Purifying.		
718				746			
719				747			
				748			
				749			

FIG. 2.

WEEK ENDING.....

Check No.	Name.	Thursday.	Friday.	Saturday.	Sunday.	Monday.	Tuesday.	Wednesday.	Ordinary Time.	Overtime.	Total Time.	Rate.	Total Wages Paid as per Wages Book.	Dissecting Amount.	Cost No.	Letter.	Description of Work.

FIG. 3.

Date of Installation.	Cost No.	Letter.	Labour, Week ending	Total Labour Six Months ending

FIG. 4.

It will be seen that the various pieces of plant comprising that section have each been allotted a number, which is known as the "Cost Number." In a similar manner all the other items of plant throughout the works, about which it was considered desirable to know the cost of repair, were given numbers. In fig. 2 the items referred to are those of manufacture. All men engaged on work of any description must be covered by a number.

It is not an easy matter to decide, when first starting the cost system, to which separate pieces of apparatus or plant a number should be allotted, and it is at this point that the system under review may be spoilt by over-elaboration. When one considers that before such a system is introduced the only information available with regard to repairs in some cases, is that contained as a lump sum under the heading "Repairs Works," it can be seen that the advantage to be obtained by even a simple dissection of this amount should be considerable. It is better to start with too few cost numbers, lumping several items together, rather than with too many. Both illustrations show several spare numbers left for the addition of new plant or machinery.

The Cost Number Book is issued to all those concerned; and it is very important that each book should be kept up-to-date and accurate. To ensure this, when any alterations or additions to the cost numbers are authorized, the necessary information is circulated by letter, which each person concerned initials as an acknowledgment that he has made the required alteration.

LABOUR COSTS.

Labour costs are first entered into a Time Dissecting Book. Fig. 3 illustrates a page from such a book. This book provides for the making of a record of each man's daily employment; the actual time spent on each job being recorded against the appropriate cost number. The information is obtained by a dissecting timekeeper or worktaker, whose duty is to visit each day-worker daily. The number of times that a man is visited during the day depends on the nature of his employment. Retort-house and other shift workers are not seen by the dissecting timekeeper. The particulars of their time and work are taken by the retort-house foreman. At the end of the week each man's time is totalled and posted up in the dissecting books. The following information is then available:

1) The actual time spent by each man on each job.
2) The amount to be paid to each man for each job and charged against the proper cost number.
(3) Each man's total earnings for the week.

This latter figure forms a very useful check on the workmen's wages as ascertained separately under an entirely different system by the wages clerk. Apart from any saving which might be effected by the cost system, the fact that every minute of the day has to be accounted for undoubtedly assists in the speeding-up of repair jobs. It will be obvious that several men may have done work during the week which has to be charged to the same cost number. When the time-dissecting book is completed, the various amounts which apply to the same cost number are collected together and posted into a Labour Costs Summary Book (fig. 4).

In this book the cost numbers appear on the left, and each page is ruled to give space for entries of costs for twenty-six weeks against each number. Also at the end of six months, by totalling horizontally, the labour cost of manufacture or maintenance incurred by each item is ascertained. By totalling vertically each week, the gross amount of wages paid is arrived at, which is again a useful check on the wages clerk.

MATERIALS COST.

The cost system, in so far as it deals with the cost of materials commences with the official order. A specimen of this is illustrated in fig. 5. This is made out in triplicate. One copy is retained by the order clerk in the order book, the second is forwarded to the firm supplying the goods, and the third is passed to the storekeeper. The copy received by the storekeeper is returned to the order clerk when the order is completed, and is filed.

GOODS RECEIVED.

Goods on arrival are delivered to the stores and examined by the storekeeper; and here should be mentioned one of the essentials to the smooth working of any system which sets out to keep account of materials used. Desirable as is an adequate and well-arranged stores on any gas-works of to-day, it is more than ever so when an attempt is made to charge each job accurately with the material used.

As far as possible, all stores should be under lock and key, and the storekeeper held entirely responsible. Unfortunately, at Tottenham, we are not too well placed in this direction. The stores are much too small, and difficulty of control is increased thereby. This state of affairs, it is hoped, will be remedied in the near future.

Telegraphic Address:
"Totdislite, Tottlane, London."

Telephone:
Tottenham 33.

No. WB 4200

WORKS DEPARTMENT.
TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.
Willoughby Lane, Tottenham.

.....192.....

M.....

Please send
Carriage Paid to Gas Sidings, Angel Road (L. & N.E.R.), Edmonton, or deliver to above address.

Please mark Order No. and Works Dept. on Label, D. Note, and Invoice.
Invoices to be sent in Duplicate the same day as Goods are dispatched.

Chief Engineer.

FIG. 5.

Invoices are received in duplicate. One of these is handed to the storekeeper, who compares the goods received with the order and invoices, and initials the latter, certifying that goods have been supplied as ordered and that the quality is correct. The cost clerk then compares the price charged on the invoice with the price accepted for the goods, and initials the invoice showing that the

STORES REF. No.....

	STORES RECEIVED.									STORES ISSUED.						
	Date.	Invoice No.	From Whom Received.	Quantity.	Total Received to Date.	Price.	Fo.	Total. £ s. d.		Week Ending 192	Quantity.	Total Issued to Date.	Price.	Cost No.	Total. £ s. d.	Remarks.

FIG. 6.

No. 8000

TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

REQUISITION.

MATERIALS.			CHARGEABLE TO	
Ref.	Quantity.	Full Description.	Description of Work.	Cost No.

Signature..... Received by.....
Storekeeper..... Date.....
Goods issued by.....

FIG. 7.

prices charged are correct. One copy of this is then passed to the proper department for payment; the other is filed by the cost clerk. In special cases, before the invoice is paid, it is further examined and initialled by a more responsible official. An official order is sent for all goods, including new plant and machinery. A large amount of this is paid for on certificate, but in such cases a note of the certificate is sent to the cost clerk so that his records may be completed. Particulars of invoices are posted in the Stock Ledger (fig. 6).

It will be seen that there are two columns for stores received, one headed "Quantity" and the other "Total received to date." The quantity column contains particulars of the amounts received on the date shown in the date column. This is added to the last amount under "total received to date," making the new total. The £ s. d. column gives the money value of the total goods received to date.

GOODS ISSUED.

Before any goods are issued from the stores, a requisition signed by the foreman in charge of the job, and countersigned by the general foreman, must be produced. Fig. 7 shows the type of requisition form used.

The cost number column is filled in by the foreman signing the requisition. All requisitions are passed daily from the store keeper to the cost clerk, and are entered by him in the Day Book of Stores Issued. (Fig. 8.) The use of this book will be made clear from the illustration. At least one page is kept for each cost number. The price of the goods is obtained from the stock ledger (fig. 6), and the amount totalled each week.

We then have, in the day book, the actual cost of materials to be charged to each job. This is transferred to the Materials Cost Summary Book, which is similar to the labour costs book illustrated under fig. 4. From this book the totals are transferred every six months to the half-yearly and yearly summary book.

Returning for a moment to the stock ledger (fig. 6), we have seen how goods received are dealt with in this ledger. The goods issued are now entered from the day book into the ledger, the value in the £ s. d. column again representing the value of goods issued to date. By subtracting the total quantity issued to date from the total quantity received to date, the quantity in stock on any day can be ascertained and checked. The figure in the

STORES ISSUED.

WEEK ENDING.....192..... COST No..... .....

—	Description of Goods.	Size, Weight, or Number.	Stores Ref. Number.	Thursday.	Friday.	Saturday.	Sunday.	Monday.	Tuesday.	Wednesday	Total for Week.	Less Credits.	Net Issues.	Price.	Folio Stores Ledger.	Total.			Remarks.

FIG. 8.

HALF-YEARLY AND YEARLY SUMMARY.

Cost No.	WAGES, Six Months ending June 30, 192 .			MATERIALS, Six Months ending June 30, 192 .			WAGES, Six Months ending Dec. 31, 192 .			MATERIALS, Six Months ending Dec. 31, 192 .			WAGES, Twelve Months ending Dec. 31, 192 .			MATERIALS, Twelve Months ending Dec. 31, 192 .		

FIG. 9.

KEY TO WAGES APPROPRIATION.

	REVENUE ACCOUNT.	
1	Coal— Unloading and Handling	701, 721, 731, 768, 769.
2	Purification— Coal Gas . . C.W.G. . . .	704, 725, 745, 764, 751 } Plus ½ each of No. 771
3	Carbonizing— Nos. 1 and 2 sections No. 3 section . C.W.G. . . .	700, 720 730 750, 752 } Plus ½ each of 753, 754, 757, 762, &c
4	Repairs— Nos. 1 and 2 sections . No. 3 section . C.W.G. . . . General . . .	2 to 199 200 to 349 350 to 429, plus ½ of 771 } Plus ½ each of 753, 754, 757, &c. 1, 430 to 436, 440 to 492, 859 to 867, &c. Special "S" numbers chargeable to us.
5	Distribution . . Mains, repairs Building, repairs	438 to 766
5a	Buildings— Rents receivable	1A

	REVENUE ACCOUNT.	
6	Coke	702, 722, 732, 758, 761, 777, 778, 850 to 858, 868 to 871
6a	Tar	759, 765, 780, 581 to 585
7	Sulphate of ammonia . . .	550 to 580, 760, 781
8	Ponders End repairs . . .	437
9	Wood Green, electricity . .	439
	CAPITAL ACCOUNT.	
10	New Buildings, Willoughby Lane	Special Numbers always prefixed "S"
11	New Buildings, Ponders End	
12	New Plant, Willoughby Lane	
13	New Plant, Ponders End	
	PRIVATE WORK.	
14	Work to be charged for	Special Numbers always prefixed "S"
15	National Insurance	As per Wages Book

FIG 10.

KEY TO WEEKLY COSTS.

Section.	Carbonizing.	Purification.	Repairs.
No. 1 retort house	700 701 702	704 725	From Cost No. 2 to Cost No. 199
No. 2 retort house	720 721 722		
No. 3 section	730 731 732	745	From Cost No. 200 to Cost No. 349
C.W.G.	750 752	751	From Cost No. 350 to Cost No. 429
General			Costs Nos. 1, 1A, 430, 431, 432, 433, 434, 435, 436, and from Cost No. 440 to Cost No. 699
Sundries			Costs Nos. 437, 438, 439, and from Cost No. 753 onwards

Total Repairs.

FIG. 11.

"total received to date" column can be adjusted for periodical stocktaking, the actual stock that remains being brought forward. The total money value of the stock can also be obtained from the figures given in the £ s. d. column, and checked by comparing with the value of goods ordered. In a few cases—such as plant or machinery passed for payment on certificate—the items are not posted in the stock ledger, but are entered at once in the stores issued day book.

Uses of System.

Having obtained the weekly summary of labour and materials costs against the respective cost numbers, these may be further summarized in due course as and when required. In our own case a summary is made every six and every twelve months, in the form shown in fig. 9. This is quite elastic, and may be readily varied to suit special circumstances. The system is very useful for providing an accurate appropriation of wages for balance-sheet purposes. The key to wages appropriation illustrated in fig. 10 is used for this purpose. This key is self-explanatory. It will be seen that against each heading is given a list of cost numbers to be charged. A reference to the cost number book at any time gives an accurate description of the items being charged under the various headings.

Weekly Manufacturing Costs.

A similar procedure is adopted in the ascertainment of weekly manufacturing costs, the key for this purpose being illustrated in fig. 11.

Many members have no doubt experienced a little difficulty at times in comparing their own costs of manufacture with those incurred in other undertakings, as different engineers naturally hold various opinions as to the items which should be charged under the several headings. In addition, it is practically impossible for the engineer-in charge of a medium-sized or large works to keep in touch daily with the nature of every man's work, and it is often left to the wages or other clerk to allocate the labour charges. Difficulty often arises in the case of a man who normally works in the yard, but often relieves a shiftworker in the retort-house or elsewhere. Without some system such as has been described, it is tedious to watch his movements and accurately allocate his time. With this system every man's earnings have to be allocated to one cost number or another. The key to the weekly manufacturing costs specifies quite clearly what numbers are to be entered under each heading; and these numbers govern every item of manufacture and repair. The allocation is done by the dissecting timekeeper instead of the wages clerk, and he has a very definite scheme to work to. Should a doubt arise at any time as to the correct number to be used, the query is referred to the engineer-in-charge of the works for his decision. In this way the latter is able to keep himself in touch quite easily. After a cost system has been at work for a few months, these queries should be very few; in fact, the only ones likely to arise are with respect to new numbers. With the key to weekly costs illustrated in fig. 11 and a cost number book, it is possible for anyone to say exactly what is included under carbonizing, purification, and repairs. For instance, the cost against the item "Carbonizing No. 1 Retort-House" is ascertained by combining the amounts standing against Nos. 700, 701, and 702. On referring to fig. 2, it will be seen that No. 700 "Carbonizing" is pure carbonizing, including machine men, firemen, lid men, scurfers, tar-tower attendants, one-third of No. 1 boiler men, and one-half of No. 2 exhauster men. No. 701 "Coal Unloading" includes all the men engaged on coal unloading for No. 1 retort-house, and No. 702 "Coke Loading" includes men on the coke gantry, men actually loading coke, and boys loading coke on piece work. The headings shown on the key to weekly costs were adopted for convenience; but if a knowledge of more detailed costs is desired at any time for purposes of comparison with other undertakings or for any other reason, this is quite easily obtained. As I have said previously, the costs against each number are summarized weekly and six-monthly; and it is a simple matter to obtain the information desired over any period. The total labour costs obtained in accordance with the "Key to Weekly Costs" are converted into costs per therm. This information is kept in the form shown in fig. 12.

This form contains cost of all materials in addition to labour costs; the cost of coal, oil, coke and materials for repairs being shown. The costs given for coal are the net costs after the value of residuals has been deducted, and are obtained by taking a percentage of the exact average contract price per ton *plus* the cost of unloading. This percentage is the net percentage of the gross cost as ascertained at the end of the previous six months' working after deducting the return for residuals. The cost per ton of coke used in water-gas manufacture is the actual average price realized during the preceding month for coke loaded into merchants' wagons on rail at works. The figure used for water gas oil is the actual gross cost per gallon of oil delivered into our storage tanks. Cost of materials used for repairs is taken from the materials cost summary book, the requisite cost numbers being collated and charged under appropriate repair headings. For the purpose of quick reference these various costs are plotted on to a chart illustrated in fig. 13.

This is found to be very useful. It can be seen at a glance which retort house is most costly, and whether water gas or coal gas is the more profitable to manufacture. With the variations in the price of coke, due largely to the fluctuations in the coal market, this is information which is very useful to have quickly.

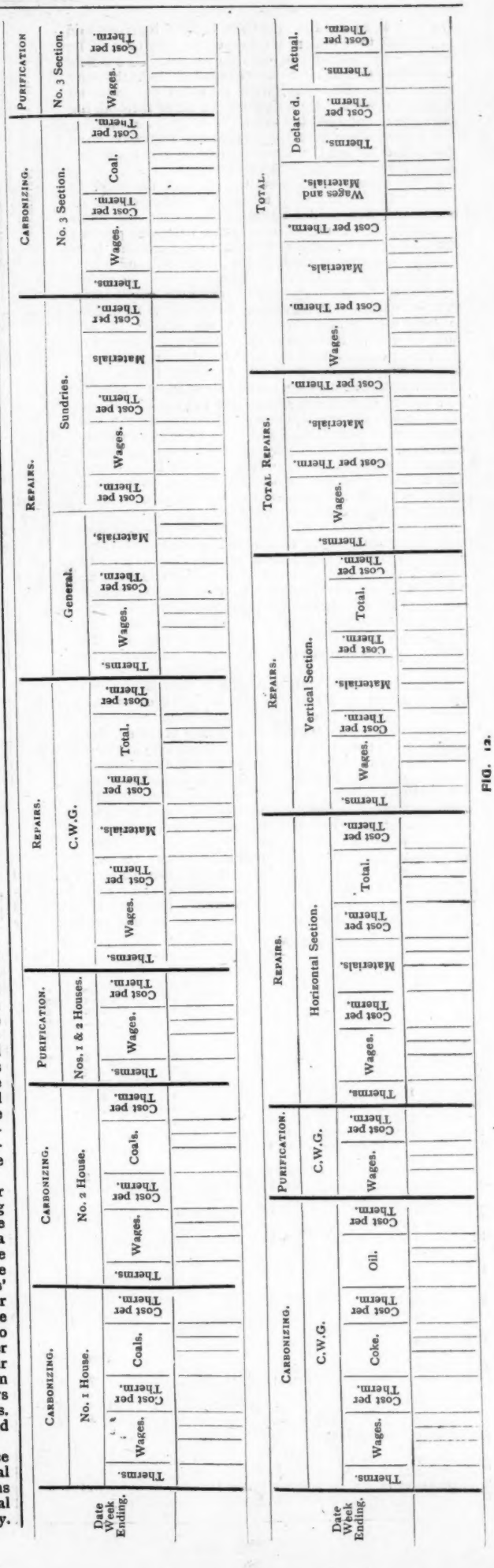

Date Week Ending.
Carbonizing. No. 1 House. Therms. Wages. Cost per Therm. Coals. Cost per Therm. Wages. Cost per Therm.
Carbonizing. No. 2 House. Therms. Wages. Cost per Therm. Coals. Cost per Therm. Wages. Cost per Therm.
Purification. Nos. 1 & 2 Houses. Therms. Wages. Cost per Therm.
Repairs. C.W.G. Therms. Wages. Cost per Therm. Materials. Cost per Therm. Total. Cost per Therm.
Repairs. General. Therms. Wages. Cost per Therm. Materials. Cost per Therm.
Repairs. Sundries. Therms. Wages. Cost per Therm. Materials. Cost per Therm.
Carbonizing. No. 3 Section. Therms. Wages. Cost per Therm. Coal. Cost per Therm. Wages. Cost per Therm.
Purification. No. 3 Section. Therms. Wages. Cost per Therm.
Total. Therms. Wages. Cost per Therm. Materials. Cost per Therm. Wages and Materials. Declared. Therms. Cost per Therm. Actual. Therms. Cost per Therm.
Total Repairs. Therms. Wages. Cost per Therm. Materials. Cost per Therm.
Repairs. Vertical Section. Therms. Wages. Cost per Therm. Materials. Cost per Therm. Total. Cost per Therm.
Repairs. Horizontal Section. Therms. Wages. Cost per Therm. Materials. Cost per Therm. Total. Cost per Therm.
Purification. C.W.G. Therms. Wages. Cost per Therm.
Carbonizing. C.W.G. Therms. Wages. Cost per Therm. Coke. Cost per Therm. Oil. Cost per Therm.
Date Week Ending.

FIG. 12.

On this chart repairs costs are lumped together, and not sub-divided under their respective headings. The repairs curves should be progressive ones. It has now been found preferable to chart repair costs in this way rather than indicate each week the actual cost incurred during the week. By following the latter method, big peaks were obtained (as can be seen from the illustration) when some especially expensive materials were used; and though these peaks could be accounted for, it was difficult to follow the mean costs.

I have endeavoured to outline some of the ways in which the system may be used to keep records of costs, and also render comparisons easier and more accurate. No doubt several other uses will present themselves to members, but an important one is in helping to arrive at decisions to scrap old and worn-out plant and machinery, or to replace that on which repairs are excessively heavy owing to overloading or other causes. It sometimes happens that an engine or pump is continually breaking down because it is not up to its work. It is repaired as a matter of course, and put to work again until the next breakdown, when the process is repeated. It is difficult without some cost system to realize how the cost of these repairs mounts up; indeed, it would not come to light at all without some special investigation. With this system the cost summaries of both labour and material may be closely examined at the end of (say) every six months. Some very interesting facts are brought to light by so doing. In our own case we found instances of overloaded machinery costing in twelve or eighteen months more to repair than would have paid for a new machine of ample size. One rather extreme case of this kind was that of a steam-engine driving a coal-elevator. This engine was of an old type and not up to its work. The costs of repairing it for six months were taken out. These were found to amount to £239 4s. 5d. A new engine of ample size was purchased and fitted for less than the six-monthly repairs costs of the old one. The repair and maintenance of the new engine for the twelve months ended Dec. 31, 1922, amounted to £15 9s. 8d.

The information obtained by the system is also extremely useful as an aid to the comparison of the merits of various types of plant and machinery—for instance, retort-charging machinery, coal breaking, elevating and conveying plant, and coke conveying and screening plant. The initial costs of installing the different types vary considerably, and to have accurate information available as to cost of repairs is invaluable when new plant is being considered. Less expensive plant, though perhaps tempting in the first instance, can easily be the more expensive in the long run. As showing the sort of information that may be obtained, the following table of ascertained costs per ton of material handled by various coal and coke handling plant may be of interest. The period covered by this table is for the two years ended June 30, 1923. While the figures given are reliable as far as they go, I should not like to say that they represent in themselves necessarily a fair comparison between the various types of machinery doing similar work. Over a period of only two years one expensive repair will considerably increase the cost per ton of material handled; but spread over (say) six years, it may be negligible. On the other hand, a piece of plant may be due for a serious repair during the twelve months after the period under review. In this case the costs given would be below the average. The longer the system is working, the more valuable it becomes in this particular direction; but provided its limitations are realized and due regard is paid to the conditions under which plant is working, its aid to comparisons is considerable.

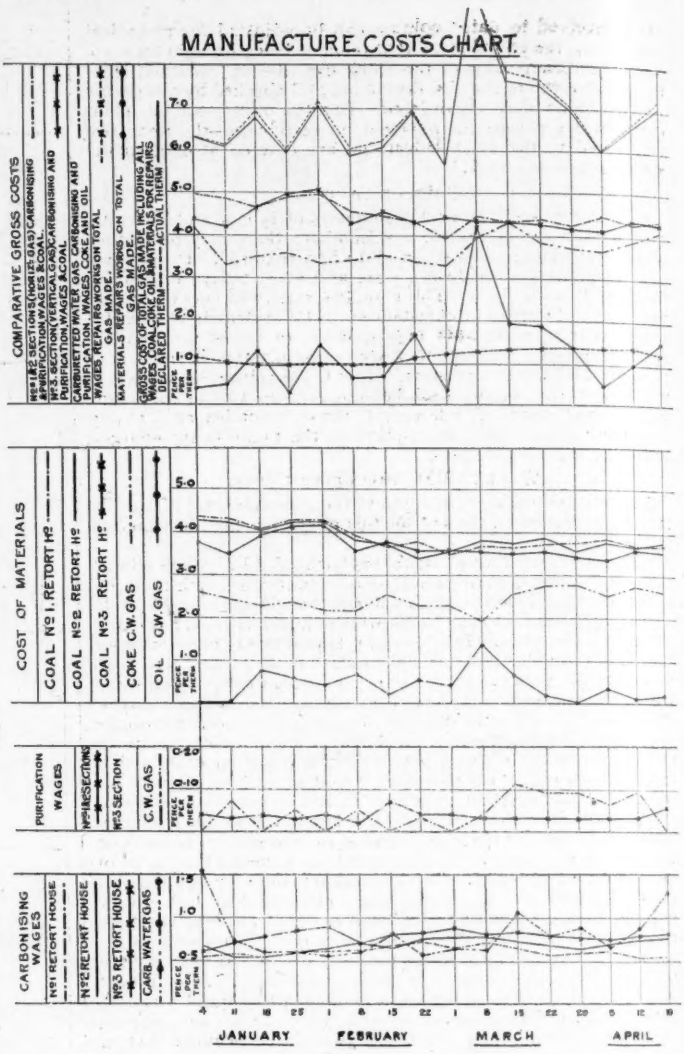


FIG. 13.

Table of Repairs and Maintenance Costs for Two Years.

—	Type of Plant.	Description of Materials Handled.	Quantity of Materials Handled.	Total Cost of Repairs and Maintenance.	Cost per Ton Repairs and Maintenance.
			Tons.	£ s. d.	Pence.
A	Charging machine	Coal	96,000	704 4 9	1·76
B	Do.	do.	66,000	182 17 9	0·66
C	Do.	do.	37,000	165 2 0	1·07
D	Discharging machine	Hot coke	46,200	319 2 4	1·66
E	Do.	do.	25,900	238 5 8	2·21
F	Coke screening plant	Cold coke	57,750	899 3 3	3·74
G	Coke conveyor and elevator	Hot & cold coke	57,750	795 15 11	3·30
H	Coke screening plant	Cold coke	61,500	717 16 9	2·80
I	Coke conveyor and elevator	Hot & cold coke	39,460	457 7 10	2·78
J	Do.	do.	22,040	423 6 3	4 61
K	Elevator and G.B. Conveyor	Coal	102,985	101 5 9	0·41
	Duplicate			76 9 9	
L	Conveyor	do.	66,000	177 19 3	0·65
	Conveyor		37,000	86 18 7	0·56
M	Hydrc. crusher and tipper	do.	96,000	77 8 6	0·68
	Duplicate			193 9 8	
N	Hydrc. crusher and tipper	do.	43,100	46 10 8	0·26
	Duplicate		55,060	64 9 10	0·28
O	Gravity bucket conveyor	Coal	43,100	500 12 7	1·55
		Cold coke	34,450		
P	Do.	Coal	55,060	251 19 2	0·61
		Cold coke	44,000		
Q	Coke conveyor	do.	78,450	138 14 8	0·43
R	Coke screening plant	do.	78,450	250 8 8	1·98
	Duplicate			396 1 4	
S	Rotary coke filler	do.	34,450	114 0 11	0·79
	Duplicate		44,000	152 7 7	0·83
T	Bucket elevator	Breeze (specl.)	19,600	68 7 10	0·83
U	Belt conveyor	do.	19,600	65 13 5	0·80

A. This machine is electrically driven, charging and discharging retorts simultaneously. It is an old machine, and has been at work for twelve years.

B, C, D, and E. These are separate charging and discharging machines of a familiar type, also electrically driven. They were installed in 1906.

The quantities given in the "material handled" column against the discharging machines are of the estimated tonnage of coke discharged.

To compare the cost of repairs to these machines with "A," the cost of a charger and discharger must be taken. The average works out at 2·11d. per ton of coal carbonized against 1·76d. per ton in the case of "A."

F. This coke-screening plant consists of a double set of jigging screens, one of which screens the coke into the hoppers, the other screening and loading from the discharge doors into trucks or sacks.

H. This is a similar plant, with the exception that the lower screens have been out of action for some time.

G, I, and J are ordinary-type link-and-bar hot coke conveyors sliding in cast-iron troughs.

The costs in these cases vary considerably. Next year "J" will probably be low; but an average of the three would give a fair average cost of each over a longer period.

K. The conveyors against "K" are the gravity bucket type elevating coal to our No. 2 retort-house hoppers. They discharge on to the push-plate conveyors "L."

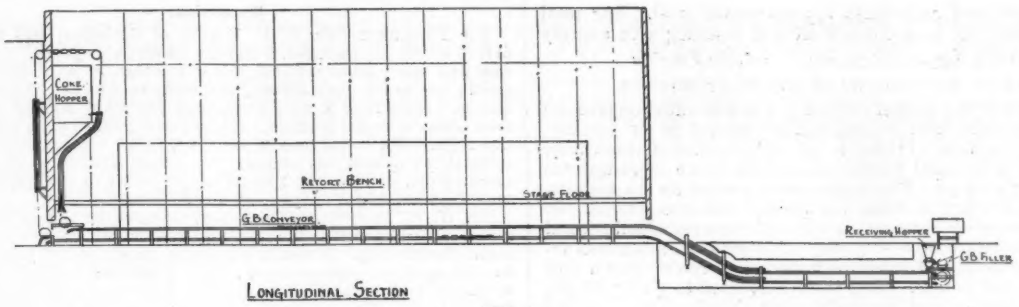


FIG. 14.

M. These crushers are "single roll" crushing against a breaking plate. The coal is crushed to 1½ in. cube.

N. The crushers here are four-roll, and are breaking coal to about 2½ in. cube.

O and P are gravity bucket conveyors handling the coal and coke in our vertical-retort house. The conveyor "O" has recently been partly rebushed and pinned and fitted with a silent chain drive, which accounts for its higher cost. Again an average of the costs of these two conveyors should give very nearly the average cost over a period.

Q is a tipping-tray conveyor taking coke from the gravity bucke conveyors "O" and "P" and discharging on to the screent "R." These are of the shaking type, and, like most screens ing plants, their upkeep is heavy.

S. The rotary coke-fillers at "S" are for receiving coke from the discharge doors of the vertical retorts and loading into the gravity bucket conveyors "O" and "P."

T is a bucket elevator for elevating special breeze to the rubber belt conveyor "U" for use on the outside producers heating the vertical section.

Special Job Numbers.

It is often desirabie to know the cost of some one particular repair that is executed in connection with a piece of plant or machinery, apart from the six-monthly or other summary of the total costs—*e.g.*, we may consider the resetting of a bench of retorts. In fig. 1, No. 200 is allotted to the north bench of our No. 3 section. This is the vertical section. These retorts were reset in 1921-22; and, for future guidance, it was desirable that the cost of repairs should be known. It would have been possible to analyze the total costs against No. 200, and so obtain the amount incurred by the retort setting only; but the operation would have been tedious. In such a case a special number is allotted to the job. Sufficient blank pages are left at the end of the cost number book for several of these special numbers to be entered as required. They are prefixed with the letter "S," and each one represents an entirely separate job—*e.g.*, the cost number S30 refers to resetting the north bench of vertical retorts in 1921-22. When next this bench is repaired, a further number will be given to the new job. The actual cost of any special job can therefore always be quickly ascertained by reference to the cost summary book. The charges for both labour and materials for special work are treated in a similar manner to work done, and charged against ordinary cost numbers, except that at the end of each six months before the six-monthly summary is made up, the amount shown against the special number is entered in red ink against the appropriate ordinary number. The six-monthly summary, in the case quoted, would show any ordinary expense charged against cost number 200, and in addition (in red ink) the special charges of S30. A note would be made in the remarks column against No. 200 indicating that such-and-such an amount had been transferred from No. S30. This is just one instance of the usefulness of the application of the costing system to special jobs. Several others will no doubt suggest themselves; but among those in which it has proved useful are in the ascertaining of the actual cost of the dismantling and resetting of horizontal retort benches, erection of boiler chimneys, dismantling a gravity bucket conveyor supplying coke to the water-gas plant, installing in its place a belt conveyor and converting a portion of the old conveyor into an elevator running at right angles to its original direction. Figs. 14 and 15 illustrate this plant before and after its conversion.

During the twelve months period ended June 30, 1921, the old conveyor cost for repairs £450, or 7·69d. per ton of coke handled. The conversion, including the purchase of a new belt conveyor, cost £1596 3s. 11d. The conveyor and elevator have now run satisfactorily since Jan. 1, 1922; the cost of repairs during the twelve months ended Dec. 31, 1922, being £47 3s. 8d., or 0·92d. per ton for the elevator, and £34 8s. 4d., or 0·67d. per ton for the conveyor. I am ready to admit that the high cost of repairs on the old conveyor would have been noticed without the cost system. In fact this was realized before the system was introduced; but this conveyor was a large and comparatively expensive piece of machinery, and the repairs to it were often of a serious nature. When the conveyor broke down, it might possibly mean a stoppage in gas-making for a short time, alternatively, that coke had to be elevated by a very expensive method. Even so, to ascertain the cost of ordinary repairs would have necessitated a special watch being kept on all the work done; and some items of expenditure could easily have been missed. With the system, nothing is missed. All time worked and materials used have to be charged against a number, and, with ordinary care, this is the correct number. The expense of the small jobs is noticed in the six-monthly summary, if not in the weekly summary; and these could easily be missed in the ordinary way.

Costs of Resetting Verticals and Horizontals.

The actual cost of resetting the vertical bench mentioned, and also that of some horizontal retorts, may be of interest. The vertical bench consisted of 28 25 ft. by 5 ft. 1½ in. by 8 in. retorts, having a nominal throughput of 6½ tons per diem each. They had worked approximately 1000 days, and had carbonized a total of 90,000 tons. They were pulled out and reset to a depth of 18 ft.; the total cost, including labour and materials, being £7975 18s. 1d., or 15·95d. per ton of coal carbonized. I may say that the coal tonnage is very much on the low side; this being due to the compulsory carbonization of unsuitable coals during most of the period of work. The horizontals consisted of a bench of 12 22 in. by 16 in. by 20 ft. retorts set in twelve beds of ten retorts each. They also had worked for approximately

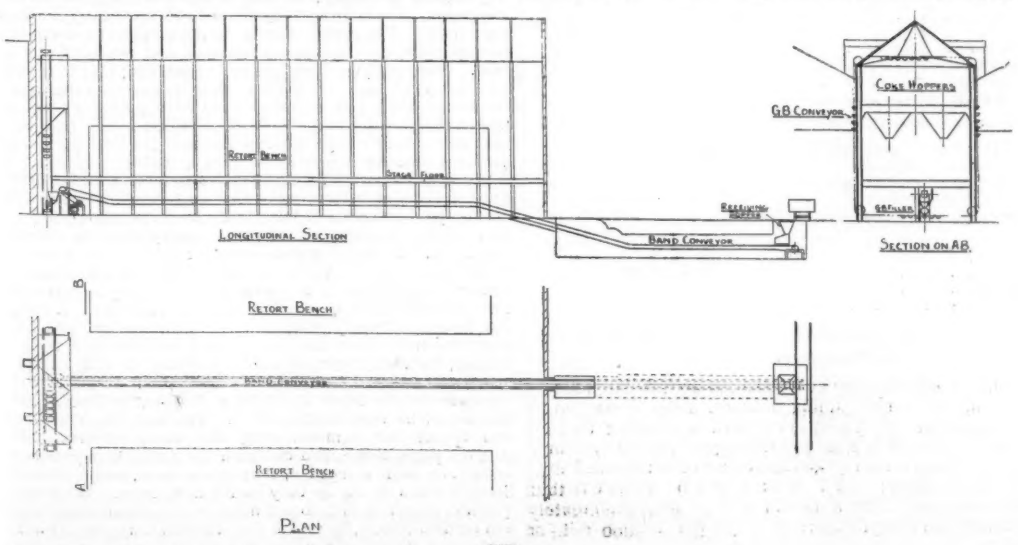


FIG. 15.

1000 days, and had carbonized 145,000 tons of coal. The total cost of dismantling to ground level and resetting with entirely new regenerators was £7707 8s. 6d., or 12·76d. per ton.

COST OF ERECTION OF WASTE-HEAT BOILERS.

An example of the system applied to a new installation is in the case of some waste-heat boilers recently erected on our vertical-retort waste-gas flues. Owing to the temperature of these flues it was decided to instal waste-heat boilers, which were ordered at a cost of £4069 4s. The boilers were erected by the makers, the charge for erection being included in the sum named. In addition to the work done by the makers there remained several jobs, more or less costly—*e.g.*, the boiler settings, the construction of the flues to and from the boilers, new run of steam and water pipes, and pumps. This work amounted to £2807 6s. 4d., making the total cost of the installation £6876 10s. 4d. In the usual way, a special number was allotted to the "Installation of Waste-Heat Boilers," and wages and materials booked against it as described. These boilers have been at work for over three months now, and have occasioned a saving of approximately 100 tons of fuel weekly, of an average value of £1 per ton.

SPECIAL WORK TO BE CHARGED FOR.

Further utility of the special job number system has been in the case of work done for outside firms. We have several consumers who generate their own electricity, driving their dynamos by means of gas-engines. We are often asked to undertake the repair of these engines and dynamos. Any such job is immediately given a special number. The cost of the job is then kept automatically and accurately, and charges which should be made against firms for whom work is being done are not missed, as they might be easily, were no such system in vogue.

In the same way, when any contracting firm is erecting plant or machinery on the works, a special number is allotted to them. Any stores which they require from us, or any small jobs which they wish us to do for them outside the contract, are accounted for and charged.

MOTOR TRANSPORT.

The system is made to apply to the keeping of costs of our motor vehicles. Each car or lorry is given its number, against which the various charges are made. The following table shows the costs of running Ford vans, Commer cars, Garrett wagons, and National Steam wagons during the twelve months ended June 30, 1923.

MOTOR TRANSPORT COSTS.

Work Done and Costs for Twelve Months ended June 30, 1923.

Costs include: Drivers' wages, mates' wages, licence, insurance, interest depreciation, repairs, supervision, tyres, fuel, oil, and water.

I.—LORRIES USED FOR COKE CARTAGE.

Item.	3½-Ton Commer.	3-Ton National Steam.	5-Ton Garrett Steam.
	£ s. d.	£ s. d.	£ s. d.
Average yearly cost	550 0 0	539 7 0	544 0 0
,, cost per ton	0 3 11·5	0 3 11·3	0 4 7·1
,, cost per mile	0 0 10·2	0 1 7·5	0 2 5·9
,, cost per worked day	1 16 8	1 15 11	1 16 3
,, yearly tonnage	2,781	2,735	2,370
,, yearly mileage	12,920	6,524	4,362

II.—LORRIES USED ON DISTRIBUTION WORK.

Item.	3½-Ton Commer.	3-Ton National Steam.
	£ s. d.	£ s. d.
Average yearly cost	565 0 0	481 6 0
,, cost per ton	0 4 4·4	0 3 11·5
,, cost per mile	0 1 0	0 1 2·7
,, cost per day	1 14 10	1 10 10
,, yearly tonnage	2,000	2,427
,, yearly mileage	10,446	7,821

III.—VANS USED FOR COIN COLLECTING.

Item.	7-Cwt Ford Vans.
	£ s. d.
Average yearly cost	373 0 0
,, cost per mile	0 0 6·86
,, cost per day	1 4 10
,, yearly mileage	13,100

CONCLUSION.

In conclusion, a word as to the cost incurred by the introduction of the system. At the beginning of these notes it was implied that a cost system might cost more than any saving to be effected by its use; and this is a very real danger. In this system the endeavour has always been to get the information desired in as simple a way as possible; and I think it will be agreed that the cost is not excessive. This amounts now to approximately £650 per annum, which is equivalent to 0·05d. per 1000 c.ft., or 0·01d. per therm.

DISCUSSION.

The PRESIDENT (Mr. E. F. Keable, of Gorleston) said he would first of all like to thank Mr. Smith for his very able paper. As was the case with many other systems, this one looked in print very complicated; but he felt quite certain, from experience he had had in another direction, that such a system appeared far more difficult on paper than it was in actual practice. He had re-organized his own distribution department on the lines of the "B.C.G.A." scheme; and in many respects this system was similar. Mr. Smith referred to its value in speeding-up; and he (the speaker) could testify to the way in which such a system helped to speed-up district work.

Mr. W. W. TOWNSEND (Colchester) thought the author was to be congratulated upon the very clear way in which he had put his subject before the meeting. It was an admirable paper, and of just the type for such an Association as theirs; but it was rather difficult to discuss, because it dealt so largely with details. There was no doubt whatever that the right thing to do was to analyze their costs in some way or another; and every one who had tried to do such a thing must agree that the system described in the paper was about as simple and comprehensive as possible. Every works could not go in for the whole scheme; but they could all consider how they could adapt an arrangement of this kind to their own circumstances. One thing that had struck him about the paper was the importance of the technical staff having the direction of affairs. The author mentioned in one place that, where the dissecting clerk got into any difficulty, he went to the works engineer for guidance. His (Mr. Townsend's) experience was that, unless technical men were in charge of work of this kind, mistakes were bound to be made. As they were in the paper, some of the figures might perhaps, without full consideration, be a little misleading. For example, there was the cost of re-setting verticals and horizontals. He was sure the author did not really mean to compare the cost of re-setting verticals to a depth of 18 ft. after running 1000 days with the cost of re-setting horizontals with entirely new regenerators. This obviously was not a fair comparison, because the regenerators would last several thousand days, and so would not have to be replaced at the end of 1000 days. Turning to motor transport, he suggested that the information included in the paper would have been much more useful if the cost per ton-mile had been given, because this was a basis they were all familiar with. He had tried to work this out, and arrived at 2·9d. for the 3½-ton "Commer," 6·5d. for the 3-ton "National" steam, and 6d. for the 5-ton "Garrett" steam. Then it occurred to him that the mileage should include the return journey. When a vehicle was delivering coke, it had to come back empty. Therefore he had doubled these figures, which came out at 5·8d., 13d., and 12d. respectively. Of course, these figures were about what one would expect, and compared favourably with horse transport. He only mentioned these matters to show that figures should be explicitly presented, if they were to yield the maximum information.

Mr. T. F. CANNING (Southend) remarked that when he approached Mr. Smith with regard to a paper for their autumn meeting, he was very gratified with the readiness with which that gentleman fell in with the proposal. There were two points about the paper that appealed particularly to him. One was the moral effect that such a complete system as this must have upon the employees of any company who adopted it; and the second was the great advantage to be derived from having a check upon any method of time-keeping. Most of them, no doubt, were familiar with the clock system of time-keeping. It was very good; but, in his experience, it was not a system which could be relied upon entirely. He knew of one authentic case of an employee who boasted that he knew no less than a thousand ways of cheating any system of clock time-keeping in existence. This, of course, was detrimental to the working of any company; and the system that Mr. Smith had outlined of visiting the men at work was really the best and only method of checking any auxiliary system of time-keeping. While this paper would form a valuable addition to the libraries of all of them, it was of particular interest to him at the moment, because he was dealing with a rapidly growing works, and he was not altogether satisfied with the partial cost system that they had in operation. He was specially grateful to Mr. Smith.

Mr. THOMAS GLOVER (Norwich) asked if the author had applied the same system to the outdoor department. Mainlaying, fitting up houses on the prepayment system, maintenance, and the multitudinous duties gas undertakings were called upon to perform to-day, absorbed a great deal of money; but this matter did not appear to come within the paper. He fully agreed with the commendatory remarks that had been made. The moral effect upon the employees of knowing that the cost of their work was being observed and recorded was very important. Men easily got into the way of thinking that they belonged to a rich company, and so it did not matter much what the work cost. No contractor could live without a good costing system; and though gas undertakings were under special conditions, they had to remember that any money wasted went to increase the cost per therm of their gas, and that any money saved went to reduce this cost. Mr. Smith referred to the cost of repairing conveyors. Everything did not depend upon the age of a conveyor. One could understand an old conveyor costing 7d. per ton for repairs, and a new one costing only a very little for the first two years; but it might be a different story when the new one was as old. It would depend upon the type. In the case of a conveyor consisting of all metal, for instance, one could understand the cost of upkeep being greater than that of a band conveyor, which was light to carry and offered little scope for destructive action. A band conveyor that he put in twenty years ago for conveying coal had been at work every day until a few months ago, and had cost very little indeed for upkeep, because there was hardly anything to wear except the band, which was renewed perhaps every four years. In the case of a scraper conveyor for the same length of coal store, he fancied the wear and tear would be very much greater. This was where a costing system was useful for demonstrating the actual figures. They could take the paper home, and compare the author's suggestions with any system, or want of system, they might have, and resolve to use Mr. Smith's ideas so far as they would help them. With regard to the question raised by Mr. Townsend as to the cost of renewing horizontal and vertical retorts, he took it this would be supplied by working it out to the cost per ton of coal put through the two systems of retorts over

a period of years. The motor transport figures were very useful and interesting. He was bound to say he was rather surprised to find the 3½-ton "Commer" wagon was put down as costing per working day £1 16s. 8d., and the 5-ton "Garrett" steam wagon £1 16s. 3d. Without going into any further analysis as to the cost per ton-mile, and so on, he might say his experience was that the steam car, with its plain strong engineering—in spite of the fact that it had a boiler which needed a new fire box and fresh tubes occasionally—was by far the cheaper machine to maintain. He thought that, if he analyzed his figures, he would find the cost of his steam wagons came out very much cheaper than the cost of the 3-ton petrol wagons, of which he also made great use, and which possessed advantages justifying their employment. In the case of the petrol wagons, it was not only a matter of cost, but also of convenience.

Mr. W. B. FARQUHAR (London) said the table showed that the yearly mileage of the three wagons mentioned was 12,920, 6524, and 4362 respectively. It would be interesting to know whether the Tottenham Company kept particular wagons for long-distance running, for short-distance deliveries, and for conveying small quantities. This might materially affect some of the figures given.

Mr. SMITH, in reply, said the President had mentioned that he was working a similar system to this on his district, and found great benefit from it in the speeding-up of various jobs. It had certainly been the experience at Tottenham that since the cost system had been working various jobs had been carried out much more quickly. Mr. Townsend said he did not think it was fair to compare the cost of re-setting verticals after doing 1000 days' work with the re-setting of horizontals, including new regenerators, after 1000 days, as the horizontals would certainly not require new regenerators after this period. This was true, and opened-up a big question as to the actual costs of verticals and horizontals. These verticals were re-set in silica to a depth of 18 ft., or practically double the usual amount. The figures were not intended to afford any hard-and-fast comparison. They were primarily given to show the sort of information that the cost system would furnish. If they liked, on another occasion they could take out the cost of re-setting horizontals down to the producer arch. Mr. Townsend also said it would have been more valuable had the transport costs per ton-mile been given. He had expected someone to make this point. Here, again, he did not want to give actual ton-mile costs, because he could not give them accurately. Mr. Townsend had gone the nearest way to getting it by taking half the mileage and the total tonnage. But this was not actually the ton-mileage, because in many cases a wagon might start with a load of 3 to 5 tons, some of which would be carried the full distance, and some only a portion of the way. As to Mr. Canning's remarks about the moral effect of the system upon employees, there was no doubt that, besides speeding-up jobs, it helped to induce men to take an interest in their work, if they knew what a job had cost when they had completed it. Mr. Canning also referred to the check on time-keeping. The Company had talked about starting the costing system on the works for some little time, and what finally decided them to do so was the desire for a check on time-keeping, in consequence of a glaring case of evasion which had come to light. Mr. Glover had asked whether they had considered the application of the system to the outdoor staff. They had a system for the outdoor staff working very satisfactorily before they got on to this new system, which might be a little difficult to apply to the distribution department in its present form. No doubt it could be adopted; but he did not think it would work so easily. As to the new type of conveyor being better than the old one, he certainly thought it was of a more suitable pattern for the job it had to do. The old conveyor used to do both conveying and elevating. Now the work was divided between the band conveyor and an elevator; and he had no doubt the costs for these would work out much lower than for the old conveyor for many years to come.

LIGHT, HEAT, AND POWER—A PLEA FOR A BROADER OUTLOOK.

By J. R. BRADSHAW, B.Sc. (Eng.), of Retford.

[A Paper read before the Eastern Counties Gas Managers' Association on Sept. 12.]

The thoughts which were uppermost in putting together the following remarks will be found to fall under two heads—

(1) Combination of the essential services.
(2) Recognition of the useful services of our competitors.

The idea of unity of control of the essential services is naturally always very much in the front of the writer's mind, from the fact that from the time when he began to serve his apprenticeship to the present moment, with the exception of one appointment, he has been identified with joint gas and water undertakings. The advantages of the joint running of these undertakings are enormous, and much greater than ever imagined by the engineer who has been concerned with only one or the other. The most important advantages occur, of course, in distribution; and they only need be mentioned to be perfectly obvious. Some of the savings are as follows:

(1) The stock of pipes and fittings can be much smaller than in the case of two separate undertakings; alternatively, better stocks can be held at a smaller proportionate outlay for each individual undertaking. The comfort of being able to carry good stocks of infrequently used and irregular fittings will be appreciated by all.
(2) The engineer is obviously able to buy on better terms, through his increased requirements in pipes, fittings, main and service laying requirements, oils, and stores generally.
(3) Smaller, or fewer, gangs for distribution work are required, as the engineer can usually arrange his programme so as to keep moderate gangs, and yet, in case of need, be able to turn them on to urgent breakdown work—such as bursts, leakages, or stoppages—at very short notice. The alternatives to this are:
   (*a*) To keep gangs to some extent standing by.
   (*b*) To "make" or "find" work to keep them together. The necessity of this on occasion is no doubt within the experience of us all, as also are the expense and extravagance of it.
   (*c*) To rely on obtaining casual labour at immediate notice. Such labour is often difficult to find, and is usually inefficient and expensive through having no experience of particular requirements and methods of setting to work. Moreover, it is very rare (certainly in the writer's experience) that casual labour can be induced to work in wet or snowy weather, however urgent the job may be; while regular steady gangs appreciate the necessity and urgency, and realize that occasional work under bad and difficult conditions is part of the price they have to pay for continuous employment, holidays with pay, and other advantages in which casual labour does not participate.

   The inconvenience and expense of these alternatives is apparent, and it is worth something to avoid them.
(4) Meter readings, accounts, collection, correspondence, and general office routine can be dealt with by the same or only slightly increased staff, with the same office accommodation.
(5) The distribution foreman has the great advantage of knowing the positions, depths, and condition of both gas and water mains and services. In the absence of this information, water mains and services are often damaged during excavations for gas mains and services. If, however, even under unified control, a water service is accidentally pricked, the same staff of fitters can deal with it and at once, instead of being flooded out and having the job held-up until the water authority is notified to carry out the repairs. This is usually an expensive as well as an inconvenient delay.
(6) Double opportunity for inspectors getting into touch with their customers is presented. This is very useful in changes of tenants and in new property. They must come to us for water, and it is up to us to make the most of our opportunity in getting gas installed.

There are also the mutual exchange of gas and water between the departments at cost price, and other matters about which more could be said; but the above points will suffice to show how very real are the advantages of unified control in two essential services which are closely allied, but are in no sense competitive, and the effect that this daily experience has had will be at once apparent in the next section of this paper.

We now come to the consideration of another important service—electricity. The ideas running through the following remarks are suggested in consequence of the writer having recently, from force of circumstances, had to consider whether gas, electricity, or both together can render the most efficient service to the community in light, heat, and power. In Retford, there has been no public supply of electricity, though there is no doubt that there has been a real demand for it—how great it is not easy to say. In 1904, the Corporation received from an eminent electrical engineer a report which strongly advocated the immediate adoption of a public supply, generated at the gas-works by town-gas engines to be run in conjunction with the gas department. A plebiscite of the whole town was taken to obtain an idea of the number of prospective consumers; and the number of possible consumers was not considered sufficient to warrant the outlay, and its consideration was dropped.

From time to time agitations for a supply of electricity have come and gone, until the question again became acute about two years ago, when the setting-up of a Joint Electricity Authority by the Electricity Commissioners received the attention of the Sheffield Corporation. Retford, from its geographical situation, fell in the suggested area; and we had to consider how we should be affected by the proposal. It was first of all definitely established by the Corporation that a supply of electricity was, if not a necessity, at least desirable, and that the town must have it from one source or another. In my capacity as Gas Engineer to the Corporation the decision had to be taken whether (1) to fight the introduction of competition tooth and nail, or (2) to take a neutral attitude, or (3) to welcome it. Eventually, the third course was decided on, though the temptation to take the first was very great for a gas enthusiast; and it may be interesting to note some of the reasons for the decision.

Our industry is an old-established one, and from quite small beginnings, when its only function was to light the highways and supply a few private customers who could afford to use gas, it has grown out of all recognition, and gone from strength to strength, until it has become one of the greatest national industries. We

are proud of our industry and of our wonderful achievements in the past and in the present, as well as the bright future before us. In view of the controversial nature of what follows, let it be said that the author is as enthusiastic in the part the industry is filling, and will continue to fill, as the most ardent gas engineer.

We have every reason to be proud of our industry and of our great strength; but one sometimes wonders whether that same strong position does not in some cases tend to our undoing. Are we not sometimes inclined to magnify our own strength and capacity to serve, and to some extent to bury our heads in the sand to hide the strength of our chief competitors?

In Retford, where there has been no public supply of electricity, the writer has had very much his own way with regard to light, heat, and power. This is shown by the fact that our make of gas is now over 100 million c.ft. of 510 B.Th.U. gas; and this in a town of only 13,400 inhabitants with not much industrial load. Nevertheless, it has been his strict policy readily to admit that our competitor has advantages over us in some particulars. This, of course, is a comparatively safe thing to do where competition is absent, and where the only practical alternative to our commodity is to convert it into electrical energy through a gas-engine. It is clear, of course, that any statements and admissions made in the absence of competition may easily be used against us if and when that competition comes from an outside source; but at the same time it is difficult to see how an honest and well thought out opinion can be varied according to the presence or absence of competition. What is true without competition is true with it.

Our most vulnerable point of attack is in particular sections of lighting—namely, shop-window lighting in drapery and other establishments (where combustible materials are necessarily near the source of light), theatre and cinema lighting, and also in small power units, such as domestic vacuum cleaners, sewing machines, washing machines, dental apparatus, hairdresser's apparatus, &c. The author remembers, of course, that he has carried out dozens of very efficient lighting and power installations, and saved customers large sums of money compared with what would have been spent in the electrical way, and has in most cases given an entirely satisfactory and better job. But it is easy to place too much reliance on the cheapness of our service. Cheapness does mean a lot, as we all know, in these days of commercialism; but it must not be the limit of our ambition. It is true that the majority of jobs can be done more cheaply in the gas way than by other kinds of energy. But are we completely filling our customers' requirements when we merely give him something cheaper than our competitors can give? It is just as reasonable to say that a red-deal staircase will do its job equally as well as a pitch-pine one, but is red deal exclusively used for staircases? No, our object is to fill the bill completely for all requirements of light, heat, and power. It is agreed that we can convert our product into electrical energy, where such energy is a real necessity, by putting it through a gas-engine driven generating set; but the writer suggests that this is a very ponderous way. We are asking too much of our customer, and it is our duty to give him his electrical energy first hand. Can we seriously consider that we are giving our customer complete service when we ask him to instal an expensive plant to give him his light and small requirements of power in the form in which he requires it? To give it him in the form in which we require him to have it, is not good enough.

These views have now been taken by the Gas Committee and, in turn, by the Corporation, who have, after full consideration, and not in any way complaining of service received the gas way, applied to the Electricity Commissioners for a Special Order to generate and distribute electricity throughout the Borough and the Rural District Council's area of about 25 miles long by 13 miles wide. The scheme is to generate electricity at the gas-works through town-gas driven generating sets, and run entirely in conjunction with the gas department. If the Order is granted, we shall then be real suppliers of light, heat, and power, and shall completely fill the bill, and not just a part of it.

Some of the savings to be effected by combining the control of gas and electricity supply only need mentioning to be evident:

(*a*) There is the important consideration that the site of the gas-works is very likely to (at Retford it actually will) suffice for the power station without incurring any further expense in this direction.

(*b*) Existing water facilities and the production of the necessary fuel at a cheap rate on the spot and without transport charges are an enormous advantage.

(*c*) Meter-reading and consumers' accounts can be done by the present meter-readers and clerks with a comparatively slight increase in the time spent.

(*d*) It is practicable and obviously more economical and more convenient to have one chief official instead of two.

(*e*) Under one chief, comparatively slight additions of technical men to the existing gas-works staff and labour will provide for running the electrical generating plant and keeping it in repair.

(*f*) A very important factor of cost is that of attendance on the plant; and the more closely it is associated with the gas-works, the greater is the saving in this direction. There are other minor savings not unimportant in the aggregate —such as office staff and the accommodation of same, purchase of materials, and storekeeping—all tending to economy in labour, buildings, and space.

To the above can be added some of the arguments which were put forward for combining gas and water undertakings.

We have made it clear to all concerned that our advocacy of the control of the electricity supply by ourselves is not with a view to stifling competition. On the contrary, the most energetic pushing of the sale of electricity by all the best modern methods of salesmanship will be adopted. The scheme is based on strictly commercial considerations—viz., that electricity can be produced more cheaply at the gas-works than anywhere else in a town, and that the Gas Department already has an organization which can distribute and sell electricity under exceedingly economical conditions. We do not argue merely that it is possible to run an electricity supply in conjunction with the Gas Department, but rather that running it in conjunction with an established successful gas undertaking is the only way in which it is possible for the town to receive a supply of electricity on a commercial basis.

It will probably be objected that this is all very well in a small town, and that we are doing the obvious thing and one that any gas engineer in the same conditions would do. But if the idea of unified control of the gas and electricity supply business is sound for small undertakings, there is no fundamental difficulty which precludes its adoption in medium-sized works, and in fact all but the very large cities. In this Association, in a membership of 91 for the year 1922-23, 48 of these are in charge of works making 100 million c.ft. of gas per annum or less. Who is bold enough to say that in towns with works of these small dimensions a separately controlled electrical undertaking can be a really successful venture? The question only needs to be asked to be answered. It will be found, however, that in these small undertakings, with one exception, the question of supplying electrical energy has not been taken up. It is my opinion, however, that even in these small towns electricity will sooner or later make its appearance; and to those of us in these small works, the message undoubtedly is to recognize it not as a competitor, but on the contrary as an ally, and enter the field with vigour and develop it for all it is worth. The exception above referred to is Oakham; and outside our Association are Crowborough and Swanage, all of whom have gone to the expense of promoting Bills in Parliament to obtain powers for electricity supply.

One is sometimes forced to think what the attitude of the gas engineers of a generation ago would have been towards the then almost new commercial product, which had not acquired the dignity or dimensions of a competitor, if they could by any means have foreseen its tremendous progress. There is no doubt that with their undoubted skill, and, as their work has proved, their brilliant engineering ideas in every direction and in every phase of our profession, had they only foreseen the tremendous possibilities and the advantage they could have given to the community in efficient, economical, and complete service, and to their respective companies and corporations, they would have at once gone wholeheartedly and enthusiastically into the matter, and left no stone unturned to give that complete service to the customer which is his right.

This being the case then, let us consider the position as we find it to-day. It is pretty clear that we still have the lion's share of the work. It is clear also that we have a process that is extremely efficient, a process which is the most economical, yet devised for efficiently treating and bringing into the service of man the nation's hitherto greatest asset—coal. It is clear, too, that so necessary are our bye-products that, as we read in one of the journals the other day, if by some fanciful legislation the gas-works of the world should perforce be abandoned as having "gone out of date," as our electrical friends are fond of stating (though they really do not themselves believe it), huge plants would at once have to be put down all over the country to provide those very vital and indispensable products in the shape of ammonia and all the thousand-and-one derivatives of that wonderful product coal tar. We have a remarkable industrial process, and (as far as can be seen) one that cannot within the range of human foresight be superseded. At the same time, it must be unquestionably recognized that electricity undertakings are very firmly established, and that they are rendering, and will continue to render, a large public service; moreover, that business should be ours.

We are, therefore, not in the position of dealing with an untried commodity, or one that is in any sense a venture. A tremendous amount of capital is invested in both branches of the service, and it may be considered that we are too late in the day to make any move towards the ideas set forth in this paper.

It is clear that at the moment it would be a waste of time and effort for the large gas companies to begin to make overtures to large electricity-supplying municipalities. There are, however, a number of towns in which the municipality own both the gas and the electricity works, and where a weak electricity undertaking is subsidized directly or indirectly by a flourishing and substantial gas undertaking. It is in such places that it is not too late to consider the position afresh, and see whether the house cannot be set in order by eliminating the strangle-hold of dual control in the administration and in the distribution of two services which are doing the same job.

It is, however, chiefly in the small towns where electricity has not yet made its appearance at all, that the example should undoubtedly be set. What we have to bear in mind—and it is said with the greatest trepidation in such a company of gas engineers

as are met here to-day, but at the same time with the firmest conviction—is that there is a real need for electricity in the interests of modern development, and that whether we like or not we must recognize it.

It is our misfortune that our predecessors did not recognize it and act accordingly; but this is no reason why we should labour under the disability a moment longer than we are actually obliged. It in no sense weakens our position as gas engineers to give way to the electric service where it can be done by the latter more efficiently or conveniently than by our own. On the contrary, there is every reason why we should do so, and thus add to our already well-established reputation as real engineers, whose sole endeavour is to give the best service possible in light, heat, and power.

Discussion.

The PRESIDENT (Mr. E. F. Keable, of Gorleston) said they had to thank Mr. Bradshaw for his paper, and for the bold way in which he had brought his subject forward. It was in many respects a difficult one to handle; but it might be that there were some present who had been faced with a similar position to that of Mr. Bradshaw. If so, they would all be glad to hear what they had to say.

Mr. C. D. WALMSLEY (Great Yarmouth) said that he himself, in common with Mr. Bradshaw, had spent the greater part of his working life in combined gas and water undertakings; and he could testify to the advantages which were so ably set forth in the paper. He was, however, afraid that the case for a combined gas and electricity undertaking was not quite so strong as for a combined gas and water undertaking. From a gasfitter to a plumber, and from a gas mainlayer to a water mainlayer, were not very big steps; but there would be a certain amount of duplicating of staffs if it were a question of a joint gas and electricity undertaking. Not many gasfitters knew much about electricity; and he did not think many electrical men knew much about gasfitting. One thing that appealed to him considerably was the generating of electricity for consumers on their own premises. He thought they would all agree that a gas-engine driven plant of a reasonable size could be put down to generate electricity, including maintenance, interest on capital, and all running charges, at something under 3d. per unit. He was hoping to develop the sale of gas-engine driven electricity generating sets by making it easy for the consumer to secure them on hire-purchase or deferred payment terms. This was a very important field.

Mr. F. A. WEST (Newark) remarked that his Town Council were negotiating for the purchase of the gas undertaking, with a view to amalgamating the two services, in the same way as at Retford. One point that occurred to him in connection with gas and electricity undertakings being under the supervision of one official was that it would put an end to competition; and he did not know whether this was altogether a good thing for a small town. In such a case, the municipal authority, if they owned the concerns, could charge practically what they liked, and relieve the rates to the extent of huge sums which would be not altogether in the interests of the consumers of either commodity. He would like to ask Mr. Bradshaw whether he considered that generating electricity with town gas would be more profitable than generating with suction gas, producer gas, water gas, or some other than his ordinary 510 B.Th.U. coal gas. Referring to the question of mains, he thought the time had arrived when all gas undertakings should prepare proper plans on a large scale of the pipes, cables, &c., laid in their district, and should keep these plans up to date, so that they would have a complete record of everything underground. Such plans would be of very great assistance in carrying out new work or repairs. When he first went to Newark, there was no record of any mains. One old man was the only person who knew where the mains were; and when his days were done, no one else would have known anything at all about the matter.

Mr. R. J. CALDERWOOD (Spalding), speaking with seventeen or eighteen years' experience of such a position as Mr. Bradshaw now occupied, said that he could thoroughly endorse all the advantages claimed by the author for a combined gas and water undertaking. The fact of being able to carry on the work of both departments with practically the one staff would, he thought, appeal to most of them. When the two departments were run separately, it was necessary to maintain a certain size of staff in each; and sometimes there was too much, and at others not enough, for them to do. With the two departments combined, it was possible, as occasion arose, to transfer from one department to the other men who were experienced in both. With regard to combined gas and electricity, for some time back the adoption of electricity had been discussed in his town. It had, in fact, occupied the minds of the councillors for many years, and quite recently they went so far as to call in an electrical expert to advise them. The matter was then again thoroughly gone into; but the Council were equally divided, and it fell to the lot of the Chairman to give his casting vote. One could appreciate his not favouring the scheme in these circumstances; for had he done so, and had it not turned out as represented, naturally he would have been saddled with the responsibility. Consequently, he voted against the scheme. Possibly, however, this would not be the end of it. The gas industry ought not to play the part of the ostrich when confronted with danger, but should tackle difficulties as they arose, and make the best of things—not for their own gain, but for the good of the public. He was at one with the author of the paper in saying that, if there was room for an electrical undertaking in any particular town, the community would be best served by a combined undertaking—provided always that the owners did not charge an exorbitant rate for current or gas and hand over the profits to the ratepayers, which would be a very wrong thing to do. He hoped to see many more combined undertakings.

Mr. A. E. BROADBERRY said he expected they had heard almost enough about Tottenham for that day; but he would like to congratulate Mr. Bradshaw upon his advocacy of gas undertakings adopting a system of electricity supply, wherever they could usefully do so. The Tottenham Company, as far back as 1898, applied to Parliament for powers for electricity supply throughout the whole of their district. These powers were not granted in an Act of Parliament, because the Board of Trade objected to such powers being so granted. They said that Electricity Orders had been dealt with by the Board of Trade; and that they had no objection to the Tottenham Company taking authority to apply for Board of Trade Orders for electricity supply. Therefore in their 1898 Act the Company took powers so to apply, and to defray the cost of the application and of the putting of the powers into execution, if and when they were obtained, out of the ordinary capital of the Company. The Company intended to go straight on with their application to the Board of Trade for Orders, but found all of the district councils in their area were making similar applications themselves. Knowing that the tendency of the Board of Trade at that time was to give preference to local authorities, the Company did not therefore carry the matter any further. This showed that, even at that early day, the Tottenham Company were quite convinced of the desirability of undertaking the supply of electricity as part of their duty to the public. He was absolutely sure that if they had been allowed at that time to commence the supply of electricity in their district, the electricity areas would have been better supplied, and at a cheaper rate, than was the case at the present time. So far as the system to be employed was concerned, nothing definite was decided; but because of the facilities that existed at the Willoughby Lane Works, and because of the cheap waste fuel always available on a gas-works for the production of power, he thought in all probability the plant would have been steam driven. At a later date—in 1913—there was one District Council in the Company's area who had not put their Order into operation. Though there had been several negotiations with the North Metropolitan Electric Power Supply Company, they failed on each occasion to come to terms; and Wood Green had no public electricity supply. The Company were then offered the Order, and made arrangements with the Wood Green Council to take it over. Wood Green, of course, was the district farthest away from their works; and therefore they had to adopt a system of generation by gas-driven plant. This had proved very satisfactory. The supply of current compared well with all the surrounding areas; and the price, though based on a different system, averaged out quite favourably, as compared with the surrounding districts. Commercially, the Company had found that the electricity supply was a fair paying proposition. Of course, round about such a large city as London, it would probably be difficult for any gas undertaking now to obtain powers to supply electricity; but in isolated country places it was worth while for the members of the Association to do all they could to get the thing into their own hands, and not allow competitors to come in. He was sure that in the long run it would be beneficial for electricity areas to be supplied in this way. Administration expenses in a joint undertaking were considerably reduced as compared with two separate concerns. There was, of course, another method of meeting the demand for current in outlying districts, where it would be scarcely reasonable to run great lengths of cable. This was the supply, already referred to in the discussion, of electricity by small local gas-driven plants. This was a very satisfactory way of securing an outlet for gas.

Mr. BRADSHAW remarked that he had really very little to reply to; he was surprised that there had not been more criticism of his paper. However, the discussion seemed to show that he was right in saying that there was a real demand for electricity, and that what gas people ought to do was to welcome it, and hitch it to their own supply, rather than go to a lot of extravagant expense in fighting its introduction. Mr. Walmsley had referred to local sets which could generate current at less than 3d. per unit. This was true; but many customers would rather pay 4d. than put down a gas-engine to generate at 3d. Cost did not, in many cases, enter into the calculation. Mr. West thought one of the things against combining electricity with gas was that it did away with competition. In his (the speaker's) case, and in Mr. West's case, there was no competition now. They had got the whole thing to themselves. As to whether for generating electricity he would use town gas, suction gas, or producer gas, his feeling was in favour of town gas.

SILICA GRAPHITE PAINTS.

The Joseph Dixon Crucible Company make high claims for their silica-graphite paints. They lay stress on the fact that many so-called failures of protective coatings are due to improper application. The difficulty may be that the paint drags under the brush, resulting in unevenness in the thickness of the coating, or it may be because of the heavy specific gravity of the pigment. Neither of these objections, they state, is present in graphite paints. Surfaces are easily and quickly covered; and because of the low specific gravity of the pigment, there is no sagging. This ease of spreading is a direct result of the lubricating quality of the graphite itself, and is the explanation of the large volume of pigment which may be incorporated in a graphite paint. As a paint pigment, graphite is inert. It is not affected by the action of the strongest acids or alkalis. Flake graphite is the only one of the carbon family that has marked endurance for an outdoor protective paint. A natural flake graphite needs something to give it further endurance; and for this reason silica is added. The peculiarity of Dixon's silica-graphite paint is that the silica is mined with the graphite, and is therefore largely a part of the graphite itself. The paint manufactured by the Company is used by many large and discriminating buyers—for example, H.M. Office of Works, the Air Ministry, the Port of London Authority, the Crown Agents for the Colonies, and the leading gas and railway companies. This points to economy in use.

Yorkshire Junior Gas Association.—The next session of the Association will commence on Oct. 20, when Mr. W. B. M'Lusky has consented to give the opening address.

THE MODERN STEAM-JET FURNACE.

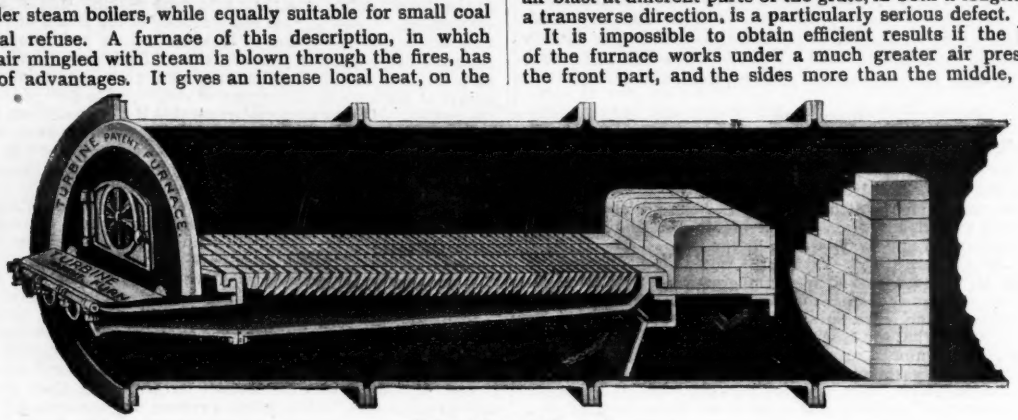
The Scientific Principles Involved in the Design of an Efficient Forced-Draught Steam-Jet Furnace, as Exemplified by the Latest Developments in the "Turbine" Furnace.

THE steam-jet forced-draught furnace is of particular interest to the gas industry; for it represents, under proper conditions, a cheap, convenient, and efficient method of burning coke and coke breeze under steam boilers, while equally suitable for small coal and general refuse. A furnace of this description, in which a blast of air mingled with steam is blown through the fires, has a number of advantages. It gives an intense local heat, on the principle of the blacksmith's hearth, with a low flue-gas exit temperature from the boiler, and the draught is under perfect control by merely adjusting a steam-supply valve. The method is particularly suitable for coke and coke breeze, enabling about 20 lbs. per hour per sq. ft. of grate area to be burnt with average fuels with a moisture content not exceeding 10 to 12 p.ct.; and in the case of coal it has the valuable property that the ash tends to be granular in character, so that cleaning-out becomes less troublesome. The life of the firebars is many years, instead of about twelve months, as under ordinary conditions, because the steam keeps them cool. Finally, the apparatus is reasonable in price, easy to instal without drilling the boiler or hanging heavy weights on to the front of it, does not project into the firehole, and is simple in design, not difficult to work, and practically impossible to get out of order.

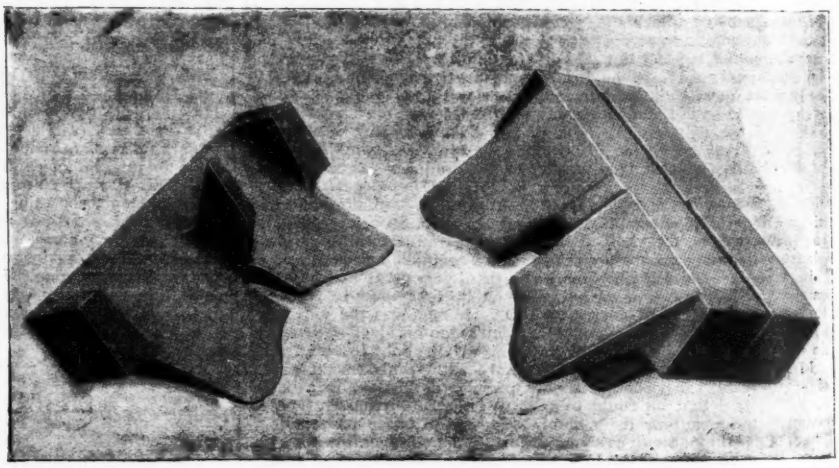
Combined with these many advantages, however, in some makes of steam-jet furnace there is a number of disadvantages—chiefly, the inequality of the draught at different parts of the grate, the excessive consumption of steam at the nozzles, wet flue gases, and excessive back-draught when the firedoors are open with steam nozzles full on, together with the fact that a large amount of fine coke breeze falls unburnt between the bars. These defects, however, may be due to inferior design, as the construction of the "Turbine" furnace, especially the latest developments to overcome the difficulties in the burning of the smallest coke breeze, shows conclusively. Very few engineers are aware of the complexity of the problems involved in the production of an efficient type of steam-jet furnace; and the inequality of the air blast at different parts of the grate, in both a longitudinal and a transverse direction, is a particularly serious defect.

It is impossible to obtain efficient results if the back part of the furnace works under a much greater air pressure than the front part, and the sides more than the middle, especially when it is remembered that the average fireman will not throw equal amounts of fuel over the grate; the tendency always being to have more fuel at the front, because it is less distance to throw. If, for example, a blast of air and steam is merely blown from one or two large nozzles into an enclosed space under ordinary firebars, forming a closed ashpit, air pressure conditions are so erratic as to make efficient combustion impossible, in spite of the general idea that the pressure is equal at every part of the bars. Thus the tendency is for the air and steam to be blown with high velocity straight along under the bars, hitting the under part of the bridge wall, and then being deflected upwards through the back portion of the grate. In consequence, by far the greater part of the combustion takes place at the back portion of the fires—just where there is a lack of fuel—and the fires burn thin at this point. Further, a large part of the air blast goes right through the thin fires, and is deflected from the top of the boiler furnace tube on to the firedoors, so that it is always dangerous (because of back-draught) to open the doors when the jets are on.

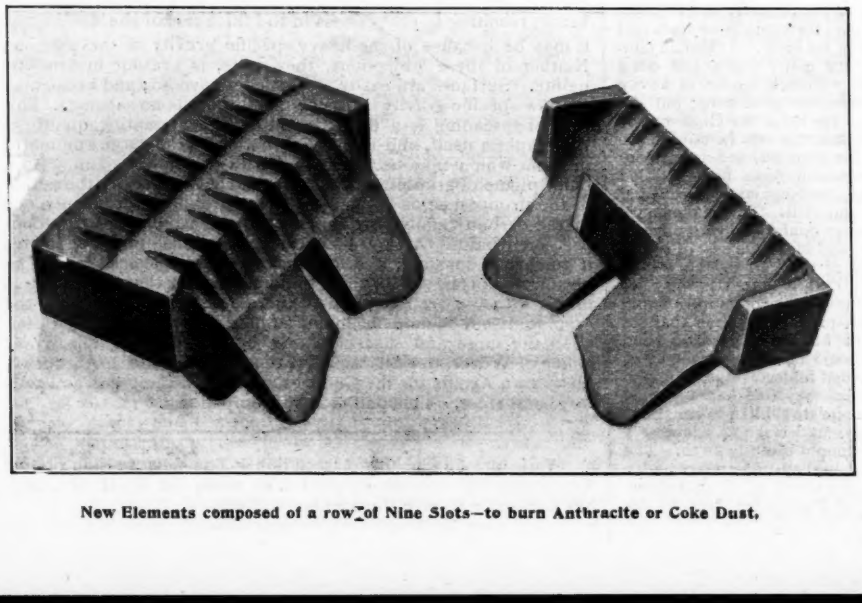
For these reasons the hollow longitudinal trough type of firebar was invented, in which the air-steam blast is directed into the inside of the bars only, with an entirely open ashpit; each bar having its own independent steam nozzle, and the blast passing upwards between small segments in the bars to the fires above.



General View of Furnace.



Ordinary Elements in the form of ⅛-Inch Slits.



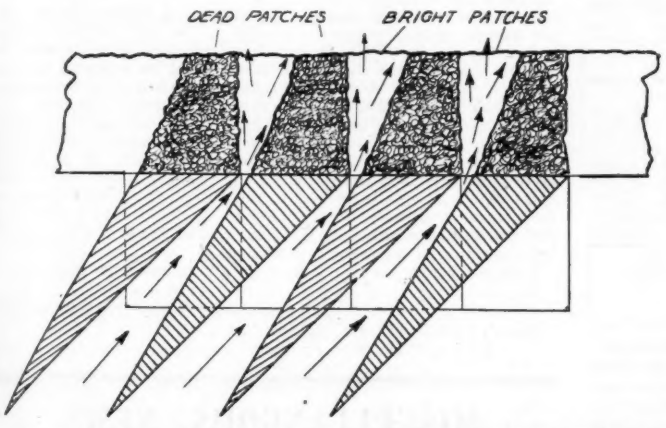
New Elements composed of a row of Nine Slots—to burn Anthracite or Coke Dust.

The essential defect in this general type of furnace is still the inequality of the air blast, though for a different reason. What happens is that the current of air and steam rushes straight along in the trough of the bars, and has not time to pass upwards to the full extent between the segments of the front part of the bars, so that it strikes against the end of the inside of the bars, and causes an excessive pressure at the back end of the grate and eddy currents in the trough itself. As a result, in most cases there is practically no air pressure at all for the first two feet of the grate length, and often an actual suction backwards into the trough for the first twelve inches. Nearly all the work has to be done, in the case of the ordinary six-foot grate, in the last four feet of the grate length, and especially in the last three feet. It is obvious that under such conditions efficiency is impossible; and this is why also an excessive amount of steam is used at the nozzles, with the resulting wet flue gases.

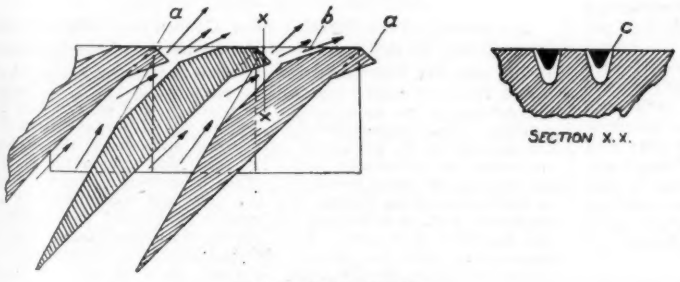
The "Turbine" furnace is a greatly improved type of this hollow-bar pattern. The general principle of the standard design will probably be already familiar to most steam users; and it will be remembered that it consists essentially of four or five longitudinal heavy cast-iron trough firebars placed side by side in the boiler furnace tube, according to the width. A cross section shows a maximum width in the trough of 5 in., while the bottom of the trough is not longitudinally horizontal, but tapers upwards from the front to the back of the boiler. This is, of course, on proper scientific lines, since the volume of air passing along the trough diminishes as the length increases, and more and more air is passed to the furnace above, so that the angle of the bottom of the trough is designed exactly to correspond with the gradually reduced volume of air. These trough firebars have lips at each end which hook over ridges on the deadplate in front, and the bridge at the back, by means of which the bars are entirely supported; and the two bars nearest the furnace walls have special cast-iron angle sectional extension pieces to make good any gap and prevent all air leakage. The "Turbine" is also placed lower in the boiler furnace tubes than the ordinary grate or most other types of steam-jet furnace, as it is maintained that this increase of combustion space gives more efficient results, particularly in the case of a bulky fuel like coke. The deadplate is accordingly sloped downwards, and supported on existing bearer brackets.

A low firebrick bridge is built at the end of the grate in the ordinary way; but 18 to 24 in. behind, a second and higher bridge is added, thus forming a combustion chamber which is claimed to aid the combustion of all fuels; and in the case of very finely divided material, containing a fairly high volatile content, it is advantageous to add a small amount of secondary air underneath to this chamber so as to complete the combustion.

Placed transversely in these large trough firebars is a large number of small cast-iron firebars or "elements" of special design which slip transverely into the trough, interlocking one behind the other; 42 of these elements, for example, forming a 6-ft. composite firebar. Each element in the standard design has a narrow air slit ($\frac{1}{8}$ in. wide) between, so that the actual surface of the grate is composed of several hundred small transverse solid firebars, with an $\frac{1}{8}$ in. slit between, giving in the first place a very even and subdivided air supply at every part of the grate. The design of these small elements is on lines not easy to describe. They rest loosely on each edge of the trough firebar, and are provided in front with a slot, and behind with a flat web or feather which fits in the slot of the element in front; and through this locking member an inclined tapered air slot or passage is formed by the engagement of the back edge of the feather of one element with the back of the recess in the succeeding element. The rear face of the blade of each element is at an angle of 45° to the top surface of the grate, and the forward face of the succeeding casting makes an angle of 60° to the same plane; the $\frac{1}{8}$-in. air slit being really the end of an inclined tapered passage. This dips or projects into the trough—that is, into the current of air and steam—so that an equal amount of the blast under pressure is diverted up each of the tapering passages, and the same amount of air and steam passes up into the furnace through each of the several hundred slits; the velocity and pressure of the air remaining constant at every section of the trough length. This design of the turbine furnace is really based on the de Laval steam turbine, for the firebars and the air trough are made to resemble as closely as possible the blades and the steam jet of a steam turbine of this character.



Section of Ordinary Turbine Furnace Bars—showing alternate Dead and Bright Patches when burning Anthracite or Coke Dust, because of the Difficulty of Ignition.



Section of New Firebars.

(*a*) Projection at back of bars. (*b*) Grooves in top and front face of bar. (*c*) Section of the air space, showing how the fine material is prevented from falling down the slots.

With regard to the design of the steam-nozzle mechanism, the ends of the trough firebars are in the form of elongated cast-iron throats or injector pipes bolted to the ends of the bars, projecting under the firebars, and being protected by a hinged sheet-iron ash cover ledge under the firedoors. These throats or injector pipes are 21 in. in over-all length, $3\frac{1}{2}$ in. in diameter at the inlet, and contracting for the first 3 in. to $2\frac{1}{2}$ in., then parallel for the next 6 in., and finally expanding for the rest of the length to 4 in., to fit the radius of the bottom of the trough firebars. The steam jets consist of $\frac{3}{32}$-in. brass nozzles attached to a main steam-supply pipe for all the bars constituting the furnaces of the boiler. These jets are of special design, only arrived at after long experiment, and are stated to have the large co-efficient of expansion of 0·67 (being equivalent in this respect to the ordinary $\frac{1}{16}$-in. nozzle), the jet spreading-out immediately at a very wide angle, and filling the whole of the injector throat a few inches from the nozzle.

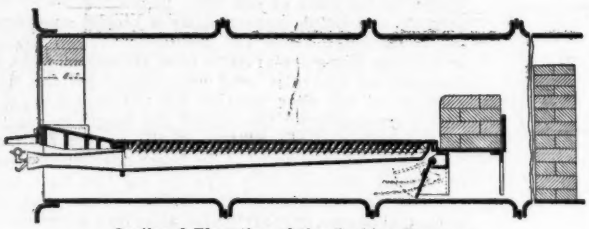
The steam supply is also superheated, being taken through a $\frac{1}{2}$ in. pipe from the boiler front, and then passed a short way into side flues of the boiler on the way to the nozzle pipe. The steam-pipe circuit to the nozzle includes a regulating valve, reducing valve, and pressure gauge, so that the intensity of the air blast can be altered instantly; the draught pressure obtained being approximately 0·10 in. W.G. for each 10 lbs. steam pressure on the nozzle.

Most elaborate investigations have recently been carried out into the performance of the "Turbine" furnace by the staff of a large steel works, in which three Lancashire boilers have been equipped, together with steam meters and other testing instruments necessary to determine the exact performance figures, with a view to fitting many other boilers. As regards the amount of steam consumed by the nozzles, the exact figure of the tests was approximately 3 p.ct. of the steam production of the plant. Thus in a given 24 hours' test the water evaporated in the boilers was 487,260 lbs., and the steam used at the nozzles 15,370 lbs.—that is, 3·1 p.ct. This is a highly satisfactory figure, because of the efficient design, and very different from the 5 to 10 p.ct. of the steam production used by some steam-jet appliances, and means at the same time absolutely dry flue gases. The results of the determination of the air pressures at all points of the grate are given in the form of curves, which are of the greatest possible interest, showing the details of the pressure in the furnace at every stage of the length, using four different steam pressures at the nozzles (100, 75, 50, and 25 lbs.)—that is, four different intensities of blast. The total over-all length of bars was 6 ft. 9 in.; but 1 ft. 6 in. of this is taken up with the solid inclined bed plate, so that the actual bar length is 5 ft. 3 in., while the effective "air-space" length is about 4 ft. 10 in. Taking the 50 lbs. nozzle steam-pressure curve as the figure most generally used of the four, there is, of course, in the actual throat of the bars a high suction caused by the steam nozzle; and this commences at about $\frac{1}{4}$ in. W.G. level with the rim of the throat, and then very rapidly increases to $1\frac{1}{2}$ in. W.G. at some point about 3 in. in the throat. The pressure curve rises sharply until, when about 9 in. in the throat, it is atmospheric—that is, 0-in. W.G. The curve goes on rising until, at $13\frac{1}{2}$ in. from the front of the throat and still about 8 in. from the deadplate end, it is at the maximum pressure of 0·80 W.G. From here to the commencement of the actual air spaces to the furnace where combustion takes place, the curve (right to the bridge) is almost a dead-straight line—good testimony to efficiency.

The same results are shown by the other three curves; and

even when the furnace is being forced at the maximum output, very much above the normal, with 100 lbs. steam pressure on the nozzles, the curve is only slightly off the straight. These detailed observations show conclusively that, at whatever pressure the nozzles be worked, there is a sharp and regular fall in the curve at the throat opening, as the air rushes in (the extent of the drop depending on the pressure and intensity of the steam blast). This is followed by a rapid rise, so that the zero point is passed about half way down the throat, and the maximum pressure is attained long before the actual combustion area is reached; and this pressure is maintained in practically a dead-straight line right to the bridge.

What exactly happens in some other types of steam-jet furnace is well illustrated by the results of similar detailed investigations into another furnace carried out at the same works, fitted on three different boilers; the steam pressure being 150 lbs. This particular furnace had a deadplate of 16 in., and an effective grate length varying from 5 ft. 6 in. to 7 ft. In the first place, the pressure drop and rise in the throats is nothing like so pronounced and distinctive, because of inferior design of the throat and the steam nozzles. The most striking characteristic is, however, that at the end of the throat there is still a very pronounced suction, and no sign of air pressure. Further—which is very serious for efficient working—the first 6 in. of the actual effective grate area has no draught at all, but a suction downwards through the fire; while in one case, at a given steam pressure, this obtains for over 12 in. The air pressure only begins to rise very slowly, not reaching the maximum until about 18 in. from the deadplate; afterwards giving a slight rise to the bridge. It is obviously quite impossible to get efficient results under such conditions. Thus



Sectional Elevation of the Turbine Furnace.

the first 6 in. of the furnace is doing no work at all, and the next 12 in. practically nothing; while in that portion of the length (the last 4 ft.) which has to take the load, the force of the blast tends to be greater at the back just where the fire is always thinnest. These very interesting results only apply to the grate from the longitudinal point of view. Similar additional experiments undertaken have proved also that in some types of furnace the air blast is unequal transversely—that is to say, there is much more air passing at the sides than in the middle—and it is almost impossible to maintain an even fire without the most elaborate care on the part of the fireman, which, needless to add, does not obtain.

Finally, with regard to the burning of coke breeze in a very fine state of division, a new modification, which is claimed to have solved the extremely difficult problem of burning anthracite dust or culm, is of particular importance to the gas industry. In the standard "Turbine" furnace, even the $\frac{1}{8}$ in. air slits still allow a small amount of the coke breeze dust to fall through unburnt; and the ordinary furnace is, of course, hopeless in this respect. Anthracite dust, of which mountain ranges exist in South Wales, is even more difficult to burn, and if the air space is further restricted, it is then impossible to pass sufficient air to maintain the output of the boiler.

The new modification of the "Turbine" furnace to overcome this difficulty is the simple and ingenious plan of using special elements, containing between them, in place of a $\frac{1}{8}$-in. air slit, eight or nine tiny slots or holes. The surface of a 6 ft. grate contains, therefore, over 2000 of these slots, so that the fine material does not fall through; while at the same time the air supply is so subdivided that it does not blow the material off the bars, but enables a bright homogeneous fire to be maintained. Thus, for example, with anthracite dust the ordinary standard "Turbine" furnace will evaporate about 3000 lbs. of water per hour in a standard 30 ft. by 8 ft. Lancashire boiler. With the new slotted "elements" the figure is 5000 lbs.—practically equal to the best coal; and it may be stated that anthracite dust is more difficult even than coke breeze dust. Finally, the "Turbine" furnace is applicable to every type of boiler, including the smallest verticals, and has now been proved, on the large Vancouver ferry-steamers, to be very suitable for marine conditions also.

Yorkshire Junior Gas Association.—A special meeting of the Association will be held at the gas showrooms, Darley Street, Bradford to-morrow (Thursday), at six o'clock, when Mr. Walter Hole, the Organizing Secretary for the Institution of Gas Engineers' Education Scheme, will give full particulars of the scheme, and answer any questions thereon. The President and Council of the Association will welcome at this meeting anyone connected with the industry who is interested. This invitation is extended particularly to the younger men, who, though not members at present, are likely to become so at some future date.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Private Oxygen Plants.

SIR,—In your issue of Aug. 29, you give extracts from an article in the June issue of "Industrial Gases" in which my previous contribution to your "JOURNAL" is adversely criticized. You draw the obvious conclusion, which any reader of "Industrial Gases" would draw, that the figures therein published originated from me. I wish to emphasize that this is not the case.

The writer of the article in "Industrial Gases," whose name I should be interested to learn, should know as well as I do that the figures which he gives are misleading to the general public. Anybody who knows anything at all about the problem of oxygen production from air would not suggest the installation of a 500 c.ft. per hour capacity plant to produce 25,000 c.ft. of oxygen per week equal to a 50 hours' working week. Liquefaction plants for oxygen production should, of course, be run non-stop for at least 100 hours per week, and can certainly not be economically run in any eight or ten hour day. If the consumer in question uses the right plant in the right way, he can certainly save at least 50 p.ct. of his oxygen bill.

During the last two years my firm alone have put up oxygen plants in this country which produce well over 1,500,000 c.ft. of oxygen per week, and which save their owners, not only 50 p.ct., but in some instances as much as 75 p.ct., of their oxygen bill. My firm employ British workmen, and a large part of their plants is of British manufacture. They have supplied, and are prepared to supply, 100 p.ct. British-made oxygen plants.

I venture to suggest that the appearance of serious competition in the oxygen trade is largely responsible for the very considerable price reductions in commercial oxygen within the last twelve months; and for this reason alone our competition should be welcome to the industry at large, and should also in due course help to substantially increase the consumption of oxygen throughout the British Isles.

"Industrial Gases," in an adjoining article of the same issue, refer to proceedings they have taken against the agent of a German firm, whose name, however, they do not wish to publish. It could easily be read as if my firm were referred to. This is again not the case; and I should be greatly obliged to the British Oxygen Company, and their various representatives or writers, if they would in future have the courtesy to mention my name or that of my firm whenever they have anything to say relating to us.

I am obliged to you, Mr. Editor, for giving this letter publicity.

O. SIMONIS,
Managing Director, Liquid Air, Ltd.

Queen's Park Works, 111, *Salusbury Road*,
London, N.W., Sept. 17, 1923.

MISCELLANEOUS NEWS.

BARNSLEY GAS COMPANY'S SPECIAL ORDER.

At a meeting of the Barnsley Town Council last Friday, Alderman Raley alluded to the question of the opposition of the Corporation to the Barnsley Gas Company's Special Order, and explained that before the Order was introduced the price charged by the Company for gas was 4s. per 1000 c.ft. in the borough, and 5s. per 1000 c.ft. outside. The Company proposed, by the Special Order, to substitute the price of 16 6d. per therm both within and outside the borough, equivalent to an increase of 2s. 11d. per 1000 c.ft. in the borough and 1s. 11d. per 1000 c.ft. outside. The Corporation offered opposition to the Order on the ground that the proposed maximum price was excessive; and, in their (the Corporation's) opinion, 13d. per therm was sufficient to charge. The Corporation further asked that the pressure at which the gas was supplied should be increased. The Board of Trade by the Order allowed the Company to charge a maximum price of 14d. per therm; and they also sanctioned a pressure of 2 in. in the Dodsworth and Ardsley areas. The price allowed was equivalent to 5s. 10d. per 1000 c.ft. in the borough and outside—an increase of 1s. 10d. before the extension in the borough, and of 10d. per 1000 c.ft. outside. As the outcome of the opposition of the Corporation, there had been a reduction in the maximum price asked of 2 6d. per therm, or 1s 1d. per 1000 c.ft. Since the Order was granted, the Company had increased the price of gas as from Sept. 30, 1922, to 1s. per therm, which was equivalent to a charge of 5s. per 1000 c.ft. in the borough—an increase of 1s. on the old price of 4s. On June 30, 1922, the Company made application for a Special Order; the principal object being to obtain power to borrow an additional sum of money, and also to secure further powers in connection with the purchase and supply of gas in bulk. At that time the Town Council had under consideration the question of the purchase of the gas undertaking; and they raised objections to the Special Order. The Board of Trade held an inquiry into the Company's application; and they eventually made an Order authorizing them to raise an additional £50,000 capital, and limited the rate of interest on borrowed moneys to 6 p.ct. There was a clause in the Order providing that at any time after the expiration of three years the Board of Trade might fix a standard price for the gas supplied. When the Order was brought before Parliament, Mr. John Potts, the member for the borough, moved that the Draft Order should be referred to a Committee for further consideration. This was agreed to, and then negotiations were commenced between the Corporation and the Company, and terms were arranged for the Company to reduce the price of gas on or before Oct. 1, 1924. It was also agreed that application might be made at any time after that date for a standard price to be fixed on those terms. Consequently the Corporation withdrew their objections to the Order.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

Stratford-upon-Avon Corporation.

The maximum price now authorized in respect of the supply of gas by the undertakers is 6s. 8d. per 1000 c.ft. for the parishes of Snitterfield and Hampton Lucy, and 5s. 6d. for the remainder of the district; and the prices they have asked the Board of Trade to substitute for these are 20·44d. and 17·34d. per therm respectively.

DECLARATIONS OF CALORIFIC POWER.

Boston Gas Light and Coke Company.—460 B.Th.U. (Nov. 1.)

Hornsey Gas Company.—500 B.Th.U., in substitution for 470 B.Th.U. (Dec. 17.)

Lea Bridge Gas Company.—475 B.Th.U., in substitution for 450 B.Th.U. (Dec. 17.)

Quorndon and Mountsorrel Gas, Coke, and Coal Company.—500 B.Th.U. (Oct. 1.)

Nottingham Corporation.—475 B.Th.U. (Dec. 8.)

Rothwell (Yorks.) Gas Light Company.—500 B.Th.U. (Oct. 1.)

St. Ives Corporation.—460 B.Th.U. (Oct. 1.)

Windsor Royal Gas Light Company.—500 B.Th.U., in substitution for 480 B.Th.U. (Dec. 20.)

WIDNES NEW CHARGES.

The Widnes Town Council last Tuesday week decided to make a reduction of 3d. per 1000 c.ft. in the price of gas as and from Oct. 1 next. The present prices are shown below, and are claimed to be the lowest in the world. [Bath has come down to 5d. per therm, but Widnes beats that Company in the matter of industrial charges.] The quality of gas that is being supplied is 480 B.Th.U. gross; and this figure has been used to ascertain the cost per therm.

For Motive Power and Furnace Purposes—

Consumption per Annum in C.Ft.	Net Price per 1000 C.Ft. s. d.	Net Price per Therm. d.
First 500,000	1 8	4·17
The next 500,000	1 7	3·96
The next 4,000,000	1 6	3·75
The next 5,000,000	1 5	3·54
The next 10,000,000	1 4	3·33
All over 20,000,000	1 3	3·13

For Domestic and Industrial Purposes—

Consumers below 3,000,000 c.ft. per annum	2 0	5·00
Consumers of 3,000,000 c.ft. and upwards per annum	1 10	4·58

We heartily congratulate the Engineer and Manager (Mr. Chas. E. Dickinson), as well as the Gas Committee.

VALUATIONS IN SCOTLAND.

In many parts of Scotland those responsible for the supervision and control of gas undertakings have been contesting the valuations proposed by assessors in the different areas, boroughs and counties. The feeling of the appellants is that hitherto throughout Scotland Assessors and Valuation Courts have been proceeding on wrong premises, and on inequitable assumptions, in fixing the basis for assessable rentals for gas undertakings.

At a sitting of the Valuation Appeal Court for the Middle Ward District of the County of Lanark, held in Hamilton on Tuesday, consideration was given to an appeal which had been lodged at the instance of the Strathaven Gas Company. It was explained by the County Clerk (Mr. R. Boyce Walker) that at Lanark on Monday an appeal by the Carluke Gas Company had been before the Valuation Committee for the Middle Ward. The Committee of the Upper Ward had decided that parties should be heard in the County Buildings, Glasgow, on Wednesday, Sept. 19. He understood that the Strathaven appeal raised a somewhat similar question to that in the Carluke case; and in these circumstances it would be for the Court to determine whether they would wish to meet conjointly with the Upper Ward Committee. Of course, if it was thought to be desirable to have a separate diet, it could be arranged.

The Court agreed to meet conjointly with the Upper Ward Committee to-day (Wednesday).

The Assessor (Mr. Alexander Murray) remarked that there was just the possibility of a settlement of these gas appeals; but, in any case, it was better to have a diet in reserve.

Reduction at Hyde.—The Directors of the Hyde Gas Company have decided to reduce the price of gas, as from Sept. 30, by 1s. per 1000 c.ft., which will make the net charges range from 2s. 8½d. to 3s. 1d. per 1000 c.ft.

Gas Fivepence per Therm at Bath.—Intimation is made by the Bath Gas Light and Coke Company of a further reduction in the price of gas, as from the taking of the indices for the September quarter, from 5½d. to 5d. per therm in the city, and correspondingly in the country districts. This reduction is equal to 2·4d. per 1000 c.ft., making the present price equivalent to, on the old basis, 2s. per 1000 c ft. The total reduction in the price of gas since March, 1922, is 10d. per 1000 c.ft.—a saving to the gas consumers of £40,600 per annum. The announcement adds: "The price of gas in Bath is the lowest in the country, and owing to this low price an all-gas house is the most economical both in money and labour."

SHEFFIELD GAS COMPANY.

Report of Nominee Directors.

The Sheffield Corporation Nominee Directors of the Gas Company, in their report for the year ended Aug. 31, state that the working of the Company has been carried on in an efficient manner; and though the depression in trade has naturally had its effect upon the output of gas and residuals, the economies in working have enabled the Company to reduce the price of gas on several occasions—making it now among the lowest in the United Kingdom. It was mentioned in the last report that the price was to be reduced after September to 8d. per therm, or 3s. 4d. per 1000 c.ft.; and this was duly put into force. After the March readings this year, it was again reduced from 3s. 4d. to 3s. 2d.; and now it is reduced another penny, making it 3s. 1d. per 1000 c.ft. to small consumers. The charge to large users will vary from 2s. 5d. to 2s. 1d., according to quantity consumed; and this reduction should be of great benefit to the city's industries generally.

The improvement in plant referred to in the last report has materialized during the present year, and the batteries of vertical retorts at Neepsend came into use during the early spring. The Tully plant has been removed from Neepsend to Grimesthorpe, to regulate the quality of coke-oven gas dealt with at that works. Showrooms have been opened in High Street which it is anticipated will, by their central position, have an important influence on the Company's sales of stoves and other fittings.

During the year 1922, the total quantity of gas sold was 4,138,593,000 c.ft., a decrease of 266,961,000 c.ft., or 6 p.ct., on the previous year. This was mainly due to bad trade; but it is satisfactory to know that the domestic consumption showed an increase. The average price of gas sold was 3s. 3·07d. per 1000 c.ft., as compared with 3s. 8·80d. per 1000 c.ft. in the previous year. The full dividend of 5 p.ct. on all stocks has been paid since the last report. The quality of the gas supplied has steadily been maintained well above the minimum (500 B.Th.U.) required during the year; and trouble with naphthalene has been greatly reduced.

Slot meters have been introduced for the benefit of small consumers; and this the nominee Directors regard as a step in the right direction. During the year extensive repairs and renewals to plant have been carried out; and the works are, in their opinion, now among the most efficient in the country. The superannuation scheme sanctioned in the Company's last Act of Parliament has been brought into operation, and will prove beneficial to all the employees concerned.

COST OF SLOT-METER SUPPLIES AT SOUTHPORT.

At a meeting of the Southport Town Council early this month, the Gas Engineer (Mr. John Bond) submitted, through his Committee's minutes, a report as to the cost of supplying gas through slot meters. It read:

Price of gas to ordinary consumers—3s. 6d. less 5 p.ct. = 3s. 4d. per 1000 c.ft. net, 8·4d. per therm less 5 p.ct. = 8d. per therm net.

Price of gas to slot consumers at 22 c.ft. for a penny = 3s. 9d. per 1000 c.ft., or 9d. per therm.

The difference in the price of gas equals 5d. per 1000 c.ft., or 1d. per therm (meter rent free to both classes of consumers).

The average consumption of gas by slot meter last year was 18,725 c.ft.

The cost of a slot-meter installation and the working of the same over and above the cost of the ordinary meter is as follows:

	Cost per Annum. s. d.	Cost per 1000 C.Ft. d.
Extra cost and upkeep of meter	5 0	3·2
Extra cost of inspection, changing of wheels, &c.	1 10	1·2
Extra cost of thefts, conveyance of copper, and the supplying of brackets and pendants	1 0	0·6
	7 10	5·0

The difference in prices of gas between ordinary meters and slot-meter installations for fifty towns in Lancashire shows an average of 5d. per 1000 c.ft. The slot consumer of 22 c.ft. of gas for a penny receives 11,000 B.Th.U. of heat. The consumers of electricity at 1d. per unit would receive 3420 B.Th.U. of heat for a penny. It may be noted that, if the consumption of gas through the slot meter increases, the difference in price between the slot-meter consumer and the ordinary consumer will decrease.

As a result of this report, the Committee resolved that they could not see their way to recommend any increase in the allowance to slot-meter consumers beyond that contained in a resolution of July 24 last, which was to the effect that the amount of gas for a penny through slot meters be increased from 21 to 22 c.ft.

Quality and Price at Accrington.—The Accrington and District Gas Board have circularized consumers stating that, from Oct. 1, the unit of charge will be the therm. The heat value declared by the Board is 450 B.Th.U.; and the price has been fixed at 11d. per therm to ordinary consumers, and 9¾d. to local authorities.

The Lighting of Dronfield Streets.—Half the number of street-lamps in Dronfield are to be lighted during the coming winter. Last year the Council considered that the tender of the Dronfield Gas Company was excessive; and the inhabitants had the unpleasant experience of groping their way along the dark streets throughout the whole of the winter. The Council at its last meeting accepted the tender of the Gas Company to light 55 lamps at 5s. per 1000 c.ft. This will be for evening lighting only. The Vicar (Rev. W. T. Groocock) and the local Parochial Church Council had requested the Council to light the church clock (a public memorial); but the tender of £13 6s. 8d. was not entertained.

HASTINGS AND ST. LEONARDS GAS COMPANY.

The recent half-yearly meeting of the Hastings and St. Leonards Gas Company was the occasion for congratulations upon a highly successful half-year's working. For the first time since the beginning of the war the Company were able to pay a dividend equal to that of pre-war days; and this in spite of substantial reductions in the price of gas.

The CHAIRMAN (Councillor Dr. G. G. Cray) said the necessity for additional accommodation and of larger and extended mains, together with increased gas sales, were sure signs of a thriving business. They had not reduced the price of gas to 1s. per therm without some difficulty and anxiety. The Board had considerable anxiety as to whether they were justified, having regard to the general state of affairs, in making the reduction; but they considered that this was the better course. They had made the reduction, and trusted that time and circumstances would justify it. They also hoped that the lower price would considerably increase the consumption, because when consumers got 100,000 thermal units for every shilling they expended, there seemed no reason why anyone should not have as much heat and light during the coming winter as he wanted. The receipts amounted to £177,115, a decrease of £7877 on the corresponding period last year; and this was mainly due to the reduction of gas rental, which was lower by £5167. When they considered that a penny per therm for the half-year meant a loss of £4600, there was no wonder that the Board felt some anxiety about the reduction. The other portion of the reduced receipts was due to the fall in residuals of a sum of £3132. The reductions from rental and residuals amounted to £8319, instead of £7877, but this was because they had had increases under sundry headings amounting to £442. The reduction in expenditure was £8674. The result was that the balanced profit, which amounted to £13,106 for the half-year, showed an increase of £797 over the corresponding period last year. As regards residuals, the reduction in coke amounted not only to the whole of the figure of £3152 which he had given, but to more than this—namely, £4111—because there had been a rise in other residuals, though the actual figure of £3152 was due, to some extent, to a matter of adjustment. Tar showed a reduction of £636, ammoniacal liquor £309, and breeze £14. As regards the expenditure, the greatest reduction was in respect of coal, which amounted to £11,699. Purification showed a reduction of £329, and repairs £4083. The latter, which a few years ago was very considerable, had now been completed. Wages showed little difference, a reduction of £266; rent, rates, and taxes, £120; printing, &c., £87; and special charges, £60. More gas had been sold; the increase being equal to 4 p.ct. The report contained a reference to a Special Order, but he did not propose to go into this, as a special meeting would have to be called to deal with it. The objects of the Special Order were for the purpose of extending the limits of the Company's power; for the purpose of bringing the powers of the Company up to date; and to confer power upon the Company to establish co-partnership and a pension and sick fund. In the neighbourhood of Hastings, houses, and especially bungalows, had been springing up; and these districts were now ripe for a gas supply. Many owners of the houses were anxious to have gas. If they had power, the Company would be prepared to deal with the matter; and this power could be obtained by a Special Order. The Company proposed to take power to supply all these neighbourhoods. It was many years since they had a General Act; and they did not wish to incur the expense of going to Parliament for a new Act.

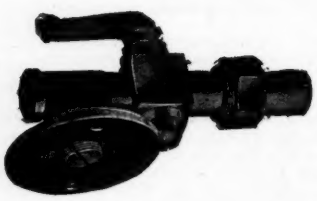
Aberdeen Corporation Gas Accounts.

The gas accounts for the city of Aberdeen for the year ended July 31 were issued to the Town Council last week. The revenue and expenditure account shows that the sale of gas yielded from ordinary consumers £121,576, gas-engines and manufacturing purposes £12,718, prepayment £67,469, and public lighting £5874. The total was £201,324, against £254,387 last year. The residual products realized—coke £50,200, tar and ammoniacal liquor £48,099, and spent purifying material £822. The revenue from gas-stoves was £2882, and rents and feu-duties £260. The total amounted to £303,592, against £340,619. On the expenditure side, the manufacture of gas cost £201,306, against £253,787; the items including—coal £146,597, coke £6146, salaries of Gas Engineer and officers at works £1465, wages of stokers and labourers £30,299, horse and stable account £1549, maintenance of works £1389, maintenance of plant (including apparatus, machinery, &c.) and labour £12,179. The distribution of gas included—wages of meter inspectors £3896, repairing and refixing meters £3498, repairing and refixing mains and service pipes £3345. Rents, feu-duties, and taxes amounted to £5814, management £4177, and general charges £2678. The total amounted to £231,510; the balance carried to next account being £62,244.

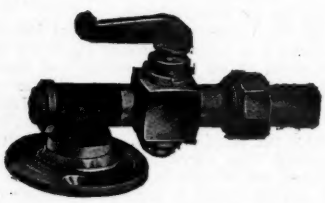
Leamington Priors Gas Company.—From the readings of the meters at the end of the Michaelmas quarter, the price of gas will be further reduced from 10d. per therm (corresponding to 4s. per 1000 c.ft.) to 9d. per therm (equivalent to 3s. 7½d. per 1000 c.ft.).

Theft from a Gas Company.—Embezzlement of sums amounting to £1400, belonging to the Cleveland Gas Company, was alleged at Gisborough recently against Donovan E. Bourne, a clerk, of Victoria Terrace, Loftus. For prosecution it was stated that, in addition to the embezzlement charges, further counts of forgery and theft would be preferred; and it would take a little time to get the evidence together. A week's adjournment was asked for. Application was made for bail. This, however, was strongly opposed, the prosecuting solicitor stating that prisoner had made an admission regarding his guilt only when it was impossible to take any other course. An adjournment was granted; but the Bench thought the case too serious to grant bail.

TWO-WAY GAS FIRE TAP



USED AS STRAIGHT-WAY TAP



USED AS ELBOW TAP

The alteration is made by changing the position of screwed plug.

SAWER AND PURVES

NELSON METER WORKS, **MANCHESTER.**

WIRES { "SAWER MANCHESTER." "SAWER NOTTINGHAM."

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¶ Simple Regulation.

¶ Thoughtful Construction.

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CARRON COMPANY Works: CARRON, STIRLINGSHIRE.

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No. 591 "STELLA" FIRE.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

In the absence of features of any particular interest, the stronger tone of the past few weeks has barely been maintained in this market. The more hopeful aspect of the American strike, and the favourable developments in the Mediterranean situation, have removed two features which were cited as likely to bring higher prices, and the hopeless condition of the mark exchange does not facilitate the placing of new business in Germany. The possibility of changes in the Ruhr situation must be taken into account, though at present no effect on the market is noticeable. It seems that any settlement in this direction must have the effect of producing more coal from the German mines, possibly to the detriment of our export quantity. On the other hand, there are those who hope that trade generally would receive such encouragement as to give the much-needed stimulant to coal for home industries.

For prompt, prices still depend very largely upon individual colliery positions. Best qualities are mostly well placed, and quoting about 24s. to 24s. 6d. f.o.b., while seconds are about 22s. 6d.; but these prices can often be discounted in cases where collieries are for any reason temporarily short of a team. The same prices are quoted for future business; but there has been so little serious inquiry ahead that true market values have scarcely been tested.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

Gas coals in Yorkshire and Lancashire are quoted at slightly higher figures. Many purchasing bodies have obtained their supplies, and those who have not yet bought will probably find they are unable to contract over a period, but will have to buy from month to month. The complaint is made in some quarters that, generally speaking, the gas industry does not work in accord with the coal trade, and many concerns are not so favourably placed as they might be if contracts were fixed regularly.

The house-coal trade is improving, owing to the change of season, and because best qualities are not on the increase. Secondary qualities are also in demand.

There is no improvement in the industrial consuming areas, particularly in the cloth-producing sections. Prices, however, remain firm, and appear likely to do so over the winter months.

In the shipping areas, there is some slight improvement, but the congestion at the Humber ports prevents any real development in this direction, while the recent high rates of exchange in the nearer European countries also prevent a greater volume of business being done.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The trade is showing some recovery. Pits in this district are in more regular operation. There is little improvement in the industrial position; but works fuel is being called for rather more freely, the prospects being regarded with renewed hope. At present, however, supplies of steam coals are in excess of the demand. Slacks are being bought on a more liberal scale for shipment. This has bettered the trade equilibrium considerably. Congestion is being relieved at pits in this area, and a normal basis has been restored. The output of nuts and beans is steadily absorbed. High-grade house coals are now being stocked to a more satisfactory extent. There is little movement in prices. Deliveries are going forward more steadily again to the gas-works. Fundamentally the position is unchanged; but the discontinuance of "summer time" enlarges the field.

Gas coke is in brisker demand, the depreciation of prices having restored its ascendancy over furnace coke for central heating and greenhouse work and various domestic purposes. Quotations range from 20s. to 26s.

It was found necessary to postpone the further conference arranged between representatives of Midland blast-furnaces and the cokeries on the price question. It is believed bottom has now been touched after the long downward course of pig iron values. Much remains to be done, however, before a sound relation can be achieved between production costs and selling prices.

New Company.—Among the companies registered is the Clayton-Murdoch Gas Appliances, Ltd. The capital is £75,000 in 60,000 preference shares of £1, and 150,000 ordinary of 2s.

"Bristol First" Exhibition.—The Bristol Rotary Club's second venture to promote the manufactures of their city has been a splendid success. A most attractive feature of the exhibition was the Bristol Gas Company's stand, which occupied a prominent position in the large hall. The point that coal is not a fuel, but a raw material, was fully stressed, and the benefits to be derived from the use of gaseous fuel were convincingly demonstrated.

Municipal Exhibition at Leeds.—The Leeds Corporation have decided to run a "Health and Municipal Services Exhibition" from Nov. 13 to Dec. 1. The object of this is to enlighten the dwellers in this district on the nature of the work done by the various departments of the Corporation. The project is receiving enthusiastic support from the various committees of the City Council; and the executive duties are being carried out by Dr. J. Johnstone (Medical Officer of Health), Mr. C. S. Shapley (Gas Manager), Mr. C. Nelson Hefford (Electricity Manager), and Mr. James Mitchell (City Treasurer). The exhibition is to be held in the Artillery Drill Hall, Fenton Street, Leeds, which has on many previous occasions proved to be most suitable for such enterprises.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 17.

Business in the tar products market continues quiet. In some quarters pitch is said to be lower in price; but in the absence of business, it is difficult to fix a definite value for this product. Creosote is firm at about 10d. per gallon net and naked. Pure benzole is about 1s. 8d. per gallon, and pure toluole about 2s. per gallon. For solvent naphtha there is practically no demand, and the price is nominal at 1s. 9d. per gallon for 95/160 quality. Crystal carbolic acid is in rather better demand at from 1s. 1½d. to 1s. 2d. per lb. Other products are without change.

Tar Products in the Provinces.

Sept. 17.

The average values for gas-works products during last week were: Gas-works coal tar, 74s. 6d. to 79s. 6d. Pitch, East Coast, 127s. 6d. to 130s. f.o.b. West Coast—Manchester, 125s. to 127s. 6d.; Liverpool, 126s. to 128s. 6d.; Clyde, 126s. to 128s. 6d. Benzole 90 p.ct., North, 1s. 2½d. to 1s. 3½d.; crude 65 p.ct. at 120° C., 10d. to 10½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 5d. to 1s. 7d. Toluole, naked, North, 1s. 7d. to 1s. 8d. nominal. Coal tar crude naphtha in bulk, North, 8d. to 8¼d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 4d. Heavy naphtha, North, 1s. 5½d. to 1s. 7½d. Creosote, in bulk, North, liquid, 8d. to 8¾d.; salty, 7¾d. to 8d.; Scotland, 6⅝d. to 7¼d. Heavy oils, in bulk, North, 8¼d. to 9d. Carbolic acid, 60 p.ct., 3s. 4d. to 3s. 5d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Safeguarding Prepayment-Meter Boxes.—When a boy pleaded guilty at Old Street to a charge of stealing money from a slot gas-meter, Mr. Hornby (prosecuting for the Commercial Gas Company) said that since some recent observations by the Magistrate about the Company's locks, there was going to be a new system, which he hoped would be satisfactory in every way.

Showroom Extensions at Sunderland.—The Sunderland Gas Company are about to make extensive alterations to their offices and showrooms at the corner of Fawcett Street and Holmeside—one of the principle points of the town. The whole of the ground floor will be gutted, and the area, the major part of which is now used as offices, will be converted into showrooms and general offices, so that the public will have to pass through the showrooms to arrive at the offices. Modern shop fronts will be fitted along the whole frontage to Fawcett Street and Holmeside; and the footpath will be widened, and the corner splayed-off.

TRADE NOTES.

Lighting Trades Limited.

From this firm we have received a copy of their new burner and glassware catalogue. This describes the full range of the well known "Kildark" burner and contains many excellent illustrations of really beautiful globes and silk shades.

Bland Burners for Domestic Lighting.

Quite a neat and attractive folder has reached us from the Bland Light Syndicate, Ltd., of No. 29, Little Trinity Lane, London, E.C. 4, in which are illustrated a number of "Bland" burners for domestic lighting, fitted with various styles of shades in glass and silk, also a "Supastone" bowl.

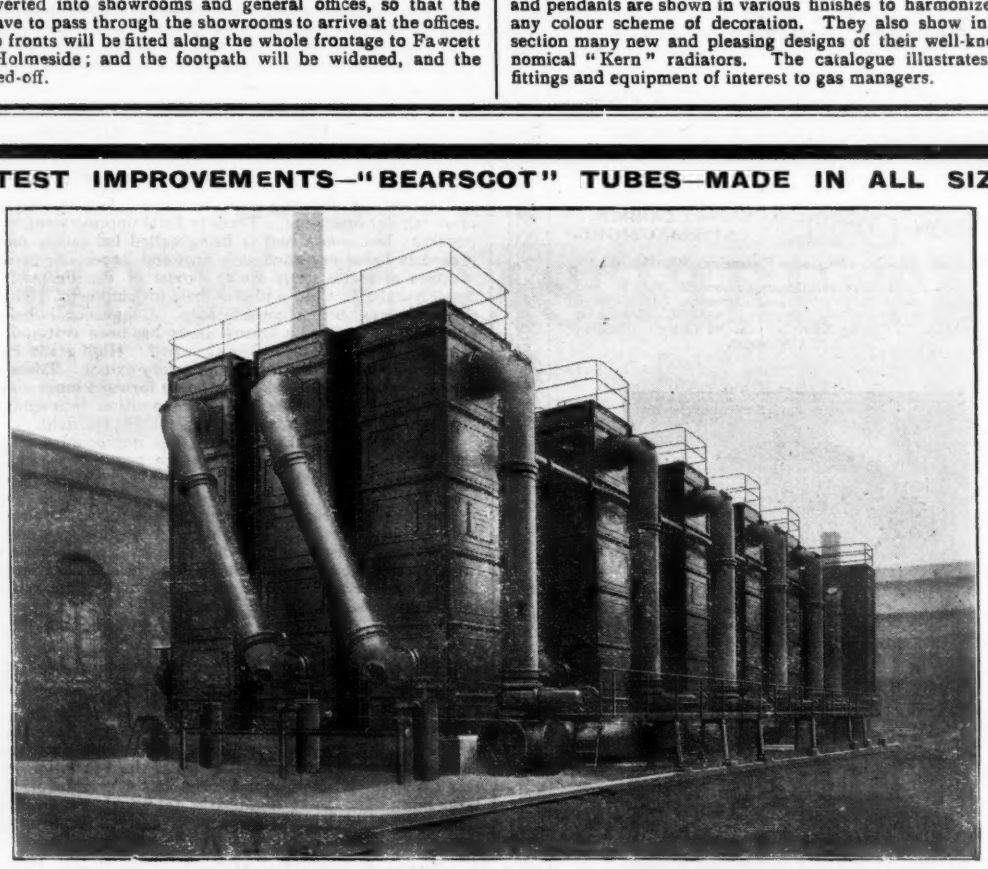
An English Holder for Canada.

News of the success of Messrs. Ashmore, Benson, Pease, & Co., Ltd., of Stockton-on-Tees, in obtaining a contract for the erection of a gasholder and tank, for the Montreal Light, Heat, and Power Co., at a cost of over £100,000, as intimated in last week's "JOURNAL," has given great satisfaction to Teesside. The order comprises a steel tank 230 ft. in diameter and 41 ft. deep, with a four-lift holder of a capacity of 8,000,000 c.ft. The price includes erection at the Villa La Selle works of the Company. The steel required will be manufactured on Teesside.

A New Welsbach Catalogue.

A comprehensive publication dealing with the full range of products for gas lighting, cooking, and heating manufactured by the Welsbach Light Company, Ltd., has reached us. This must be as extensive as any ever issued to the gas industry, and surpasses in completeness even their own encyclopædic issue of last year. The catalogue contains particulars, illustrations, and prices of all their current types of mantles used for gas lighting. The range of burners includes all their well-known designs in both upright and inverted types, incorporating several improvements in construction. They have been able, owing to improvements in manufacture, coupled with an ever-growing demand, to reduce the price of these burners for the coming season. New designs of burners will be found described in the catalogue, each and all of the best finish and workmanship. They again illustrate their solidly-constructed street-lighting and superheater sets, most of which are now fitted with micrometer air-adjustment and a specially-designed gas-regulator. Many new and elegant designs of brackets and pendants are shown in various finishes to harmonize with almost any colour scheme of decoration. They also show in the radiator section many new and pleasing designs of their well-known and economical "Kern" radiators. The catalogue illustrates many other fittings and equipment of interest to gas managers.

LATEST IMPROVEMENTS—"BEARSCOT" TUBES—MADE IN ALL SIZES.



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CAPACITY "20 MILLION" CUBIC FEET OF GAS PER DAY.

R. & J. DEMPSTER, LTD., MANCHESTER.
LONDON OFFICE: 34, VICTORIA STREET, WESTMINSTER, S.W.1.

STOCK MARKET REPORT.

OWING partly to the absence of Jewish members on account of the New Year holidays, business on the Stock Exchange was restricted during the past week. The provisional settlement of the Greco-Italian question and the modified report on the Japanese calamity produced a firmer tone. Gilt-edged securities showed further improvement, and prices were maintained generally during the whole week, although on Thursday Consols receded slightly.

There were improvements in the quotations of a number of Gas Stocks over the previous week, British "A," Commercial 4⅛ p.ct. and 3½ p.ct., Hastings and St. Leonards 5 p.ct., Plymouth and Stonehouse 5 p.ct., Wandsworth "C," and the Commercial and South Metropolitan debentures all appreciated.

The following transactions were recorded: On Monday, Brentford 4 p.ct. debenture 79, British "A" 12⅜, 12 7/16, Commercial 4 p.ct. 95½, Gas Light ordinary 96½, 96⅝, 97, 97½, 97⅛, Imperial Continental 162¾, 162½, Maidstone debenture 55½, 56, South Metropolitan 98, 98⅛, 99, Tottenham "B" 103½, Brighton and Hove 6 p.ct. "B" preference 105, Cape Town 5 p.ct. debenture 76, Croydon 4 p.ct. debenture 78½, 79. Guildford consolidated 79½, 80, Southend 4 p.ct. debenture 77½, 78½. On Tuesday, Bombay ordinary 5½, British "A" 12⅛, 12⅜, Commercial 4 p.ct. 96, Gas Light ordinary 96¼, 96⅜, 97, 97⅛, 3⅜ p.ct. maximum 66⅜, debenture 63¼, Imperial Continental 162, 163, Montevideo 50, South Metropolitan 98, 99, Wandsworth (Wimbledon) 111, Harrow 5 p.ct. 102⅜. On Wednesday, Bombay ordinary 5⅜, 5½, Brentford "A" 102, 103, British "A" 12⅛. Commercial 4 p.ct. 97, Gas Light ordinary 96⅜, 97⅛, 3½ p.ct. maximum 65⅛, 4 p.ct. consolidated preference 81⅛, 82⅜, Hastings 3½ p.ct. 78, Imperial Continental Cap. 161½, 163, Primitiva ordinary 6s., South Metropolitan 97⅛, 98¼, 98⅛, 99, 3 p.ct. debenture 62⅜, South Suburban 102, 102½, Wandsworth new 3½ p.ct. 102½, 103, Harrow 5 p.ct. 102⅜, Cardiff consolidated 99, Leatherhead 5 p.ct. 11½, 11⅝, Liverpool 5 p.ct. 88. Thursday, Cardiff 7½ p.ct. debenture 109½, Commercial 3 p.ct. debenture 62, European 7½, Gas Light ordinary 97½, 97⅛, 97⅜, 3 p.ct. debenture 62½, 64, 4 p.ct. consolidated preference 81⅜, Imperial Continental 162, Liverpool 7 p.ct. preference 107, Montevideo 49, 50, North Middlesex 10 p.ct. 16½. Primitiva 5 p.ct. preference 30s., South Metropolitan 98, 98½, South Suburban 5 p.ct. 102, 102½, Swansea 6½ p.ct. debenture 105½, Tottenham "B" 103, 104. On Friday, Alliance and Dublin 70, Commercial 4 p.ct. 95½, 96, 3 p.ct. debenture 62, Gas Light ordinary 97½, 97⅜, Primitiva ordinary 6s., 5 p.ct. preference 30s., South Metropolitan 98½, Crowborough 39½, 40, Grays and Tilbury "B" 7 p.ct. 7 15/16, 8, Hornsey 10 p.ct. 191½.

There is little to record in the Money Market, which practically remains unchanged. Money was in good demand; discount rates being steady. Silver rose during the week and finished at 31½. The Bank of England rate is 4 p.ct., as fixed on July 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Variation. Present Quotations.	Variation. Lowest and Highest Prices of Transactions
£			p.c.					
131,978	Stk.	Aug. 9	—	5%	Aldershot 5 p.c. max. C.	..	72—77	...
190,492	,,	,,	4	4%	Do. 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Apl. 5	2½	5%	Alliance & Dublin Ord.	59—64	72—77	70
374,000	,,	July 12	4	4%	Do. 4 p.c. Deb.	76—79	62—67	...
280,000	5	May 17	7½	4/-	Bombay, Ltd.	5⅜—6⅜	5⅜—5⅝	5⅜—5⅝
100,000	5	Aug. 9	16	8/6	Bournemouth Gas and Water 5 p.c.	..	11⅝—12⅜	...
383,110	10	,,	7	7/-	Bournemouth Gas and Water B 7 p.c.	15—15½	11⅝—12⅜	...
115,000	10	,,	6	6/-	Bournemouth Gas and Water Pref. 6 p.c.	13½—14	10⅜—11⅛	...
162,025	—	June 28	—	4%	Bournemouth Gas and Water 4 p.c. Deb.	..	77—82	...
992,045	Stk.	July 12	14	61/-	Brentford A Consolid.	261—266	100—105	102—103
734,920	,,	,,	11	61/3	Do. B New	204—209	100—105	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	83—88	...
221,400	,,	June 14	4	4%	Do. 4 p.c. Deb.	91—93	..	79
214,745	,,	Aug. 23	11	11%	Brighton & Hove Orig.	208—213	171—176	...
244,200	,,	,,	8	8⅛%	Do. A Ord. Stk.	154—159	127—132	...
1,287,500	Stk.	July 26	5	5%	Bristol 5 p.c. max.	..	94—95	...
570,000	20	Mar. 22	12½	10/-	British A Ord.	44—45	12—13	12⅛—12⅝
100,000	10	June 28	—	7/-	Do. 7 p.c. Pref.	..	11⅝—12⅜	...
120,000	Stk.	,,	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
220,335	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	56—59	...
100,000	10	May 17	—	7/-	Cape Town & Dis., Ltd.	1⅞—2⅛	6¼—7⅛	...
100,000	10	May 3	—	4/6	Do. 4½ p.c. Pref.	4—6	6—7	...
150,000	Stk.	June 28	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	70—75	...
237,860	,,	,,	—	7½%	Cardiff 7½ p.c. Deb.	..	106—111	109½
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	July 25	5/9/4	60/-	Commercial 4 p.c. Stk.	106—108	95—98	95½—97
560,000	,,	,,	5½	60/-	Do. 3½ p.c. do.	103—105	95—98	95½
475,000	,,	June 14	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	60—64	60—62
600,000	,,	14 Jan. 15	4	—	Continental Union, Ltd.	76—79	33—38	...
300,000	,,	Dec. 14	7	4%	Do. 7 p.c. Pref.	115—118	72—77	...
660,000		Aug. 9	—	6⅛%	Croydon sliding scale.	..	101—104	...
284,975		,,	—	5%	Do. max. div.	..	82—85	...
492,270	Stk.	,,	6	4⅛%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
209,000	,,	Apl. 5	—	5%	East Hull 5 p.c. max.	..	..	...
1,002,180	10	July 12	10	5/-	European, Ltd.	17½—18	7½—8½	7½
16,546,120	Stk.	July 26	4/17/4	52/-	Gas Light & Coke 4 p.c. Ord.	98—102	96—98	96½—97½
2,600,000	,,	,,	3½	35/-	Gas Light & Coke 3½ p.c. max.	76—79	65—68	65½—66½
4,062,235	,,	,,	4	4%	Gas Light & Coke 4 p.c. Con. Pref.	96—99	80—83	81½—82½
4,761,930	,,	June 14	3	3%	Gas Light & Coke 3 p.c. Con. Deb.	72½—74½	61—64	62½—64
130,000	,,	Dec. 11	10	10%	Gas Light & Coke Coke	..	..	...
42,000	—	—	—	—	Gas Light & Coke 10 p.c. Bonds	..	..	...
82,500	,,	Mar. 8	5	65/7½	Gas Light & Coke 7½ p.c. Ilford Deb.	..	..	...
258,740	,,	,,	3½	50/7½	Hastings & St. L. 5 p.c.	..	95—100	...
70,000	10	May 17	11	10%	Do. 3½ p.c.	87—89	77—82	78
86,600	Stk.	Aug. 23	9	9⅛%	Hongkong & China, Ltd.	16½—16⅞	15—16	...
1,976,000	,,	May 31	9	£17	Hornsey 7 p.c.	..	144—149	...
404,800	,,	Aug. 9	3½	3½%	Imperial Continental	150—160	160—165	161½—163
235,242	,,	,,	6¾	6¾%	Do. 3½ p.c. Deb. Red.	84—86	76—78	...
2,493,905	,,	Feb. 26	10	37/6	Lea Bridge Ord. 5 p.c.	119—121	95—100	99
600,000	,,	Mar. 22	—	7%	Liverpool 5 p.c. Ord.	..	..	88
165,736	,,	Aug. 23	7/5/6	90/-	,, 7 p.c. Pref.	..	106—109	107
63,480	,,	June 28	—	3%	Maidstone 5 p.c.	..	104—109	...
75,000	5	June 14	6	5/6	Do. 3 p.c. Deb.	..	52—57	53½—56
50,000	100	Apl. 3	4½	4½%	Malta & Mediterranean Met. of Melbourne 4½ p.c. Deb.	99—101	97—100	...
341,920	Stk.	May 17	4	4%	Montevideo, Ltd.	11½—12	49—54	49—50
1,875,892	,,	July 26	4½	4½%	Newcastle & Gatsh'dCon.	98½—99½	84½—84⅝	84
250,166	,,	Aug. 9	—	4%	Do. 4 p.c. Pref. Stk.	..	74½—76½	...
529,705	,,	June 28	3½	3½%	Do. 3½ p.c. Deb.	82—83	71—73	...
15,000	10	Aug. 23	—	11/-	North Middlesex 10 p.c.	..	16½—17½	16½
75,940	10	,,	7/14/0	7/8⅞	,, 7 p.c.	14—15	11⅝—12⅜	...
300,000	Stk.	May 3	8	7%	Oriental, Ltd.	117—122	97—102	...
188,120	Stk.	June 28	—	78/9	Plym'th & Stonh'se 5 p.c.	..	108—113	...
60,000	50	Sept. 6	13	65/-	Portsea Island, B	128—131	100—105*	...
100,000	50	,,	12	60/-	Do. C	118—121	97—102*	...
1,450,345	5	29 Oct. 14	8	—	Primitiva Ord.	5⅛—6	4⅜—4⅝	6/-
2,199,800	5	30 Dec. 15	5	—	Do. 5 p.c. Pref.	4⅝—5	1½—2⅛	30/-
341,400	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	70—74	...
600,000	Stk.	July 26	4	4%	Do. ,, 1911	..	56—59	...
321,670	,,	June 28	4	4%	River Plate 4 p.c. Deb.	85—87	56—59	...
150,000	10	Mar. 22	6	6/-	San Paulo 6 p.c. Pref.	10½—11	5⅞—6⅛	...
125,000	50	July 2	5	5%	San Paulo 5 p.c. Deb.	47—49	38—41	...
270,000	Stk.	Aug. 23	10	5%	Sheffield A	223—224	102—104	...
419,968	,,	,,	10	5%	Do. B	222—224	101—103	...
1,047,000	,,	,,	10	5%	Do. C	220—222	101—103	...
133,201	Stk.	—	4	3%	Shrewsbury 5 p.c.	..	..	...
90,000	10	May 31	9	9/-	South African	10½—11⅛	7⅛—9⅛	...
6,609,895	Stk.	July 26	5/4/0	50/-	South Met. Ord.	111—113	97—99	97½—99
250,000	,,	July 12	—	5%	Do. Red. Pref.	..	98—100	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	61—64	62½
734,000	,,	Sept. 6	—	6⅛%	Do. 6⅛ p.c. Deb.	..	105—107*	...
91,500	,,	Aug. 23	8½	4⅛%	South Shields Con. Stk.	157—159	127—129	...
1,087,795	,,	,,	6	6%	S'th Suburb'n Ord. 5 p.c.	114—116	100—103	102—102½
368,837	,,	June 28	5	5%	Do. 5 p.c. Deb. Stk.	116—118	95—100	...
647,740	,,	May 3	5	7%	S'th'mpt'n Ord. 5p.c. max.	99—102	88—91	...
121,275	,,	June 28	4	4%	Do. 4 p.c. Deb. Stk.	..	72—77	...
250,000	,,	Aug. 23	—	70/-	Swansea 7 p.c. Pref. Stk.	..	102—104	...
200,000	,,	June 28	—	6½%	Do. 6½ p.c. Deb. Stk.	..	105—107	105½
120,000	,,	July 26	—	8%	Tottenham District A 5 p.c.	135—138	120—125	...
785,275	,,	,,	6	6⅛%	Tottenham District B 3½ p.c.	115—117	100—105	103—104
181,255	,,	June 14	4	4%	Tottenham District 4 p.c. Deb.	87—89	78—82	...
258,251	Stk.	Aug. 23	9	2⅛%	Tynemouth 5 p.c. max.	108½—109	88—90	...
30,000	,,	July 12	8½	90/-	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	126—131	...
258,636	,,	,,	6½	75/-	Do. B 3½ p.c.	129—134	112—117	...
108,075	,,	,,	—	63/-	Do. C.	..	98—103	...
140,805	,,	,,	—	63/-	New Ordinary	..	97—102	102½—103
552,000	,,	,,	6½	71/3	Wimbledon 5 p.c.	117—122	109—114	111
98,000	,,	,,	6½	76/3	Epsom 5 p.c.	121—126	113—117	...
88,476	,,	June 28	3	3%	5 p.c Deb. Stk.	66—69	57—60	...

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For Information Only.

CLAYTON-MURDOCH GAS APPLIANCES, LIMITED.

(Incorporated under the Companies Acts, 1908 to 1917).

SHARE CAPITAL - £75,000.

Divided into 60,000 7½% Cumulative Preference Shares of £1 each and 150,000 Ordinary Shares of 2/- each, of which 60,000 Preference Shares and 60,000 Ordinary Shares are now offered for subscription at par, payable: Preference Shares: 2/6 per share on Application, 7/6 per Share on Allotment, 5/- per Share 1 month after Allotment, 5/- per Share 2 months after Allotment.

Ordinary Shares:—In full on Application.

Each subscriber will have the right to apply for, and have allotted to him, one Ordinary Share of 2/- for every Preference Share subscribed for by and allotted to him. No application for Ordinary Shares alone will be entertained.

There are no Debentures or other Charges on the Undertaking.

This Company has been formed to acquire (*a*) the British Patent Rights in respect of the "C.M." Gas Switch (at present the subject of Provisional Protection), a simple and inexpensive device for lighting and extinguishing the gas at a distance, in the same convenient manner as with the electric light (*b*) a beneficial contract for the exclusive British rights of manufacture for the "L.W." Dynamo, a machine of exceptional character and features, and (*c*) certain stock-in-trade, implements, tools, &c., requisite for the manufacture of both the "C.M." Gas Switch and the "L.W." Dynamo.

The "C.M." Gas Switch has no relation to the by-pass system, which has many objections, and renders gas lighting as safe and handy as electric lighting at considerably less cost. In addition to household lighting, the lighting of gas stoves, the clock control of gas lights, shop window and stair lighting, &c., are further examples of its range of usefulness.

This invention presents the following points of interest:

(*a*) It is operated by a switch, either on the wall or in any other desired position.
(*b*) It turns the gas on and lights it, and turns it off again, as required.
(*c*) It may be fixed to any existing gas light burner, and fitting presents no difficulties.
(*d*) It has no complicated parts to go wrong in operation.
(*e*) It acts as a safety device, as the gas cannot be turned on accidentally without being lit.
(*f*) It costs the consumer only 15/6 per Switch.
(*g*) It obviates the use of matches—so detrimental to the life of mantles.

A conclusive and satisfactory report on the efficiency of the invention has been made by Messrs. Alexander Wright & Co., Ltd., Engineers, of Westminster Palace Gardens, recognized authorities on all gas apparatus.

On the basis of the figures given in the Prospectus the Preference Dividend is covered seven times over, but, as the fixed dividend requires only £4500, the balance remaining, after making provision for Taxation and Reserves, would be sufficient to pay a subscriber to one Preference Share and one Ordinary Share (at a total cost of 22s.), dividends equal to 4s. or nearly 18 per cent. per annum.

Prospectuses dated Sept. 14, 1923, and Application Forms can be obtained at the Registered Offices of the Company, CAPEL HOUSE, NEW BROAD STREET, LONDON, E.C. 2.

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Parkinson Stove Company, Ltd.	Centre XIII.
Parkinson, W., & Co.	774, 806
Peckett & Sons, Ltd.	880
Peebles & Co., Ltd.	881
Penney and Porter, Ltd.	879
Penningtons Engineering Tutors	879
Perch, William, Ltd.	880
Pifco, Ltd.	772

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Piggott, Thos., & Co., Ltd.	772
Pinchbeck, Ltd.	770
Pleno, Ltd.	Centre XIV.
Pocock, Herbert	Wrapper I.
Podmore, A. E., & Co.	805
Potterton, Thos.	Centre XII.
Procter, E. W.	784
Pulsometer Engineering Company, Ltd.	Wrapper IV.
Radiation, Ltd.	Centre II., III.
Reavell & Co., Ltd.	886
Richmond Gas Stove & Meter Co., Ltd.	—
Ride and Bell, Ltd.	798
Riley, John, & Sons, Ltd.	—
Robson, Geo., & Co.	881
Rotary Meter Company, Ltd.	798
Safety Globe Co.	781
Sawer & Purves	874
Serck Tubes, Ltd.	—
Shell-Mex, Ltd.	891
Shields & Ramsay	—
Sigma Instrument Company	—
Simon-Carves, Ltd.	769
Simplex Concrete Piles, Ltd.	—
Smith, J. & W. B., Ltd.	797
Smith Meters, Ltd.	—
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Spencer-Bonecourt, Ltd.	—
Spencer Chapman, & Messel, Ltd.	879
Spencer, Walter, & Sons	879
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Stanton Ironworks Co., Ltd.	—
Staveley Coal & Iron Co., Ltd.	889
Stein, J. G., & Co., Ltd.	Wrapper I.
Stephenson, Andrew	879
Stewarts & Lloyds, Ltd.	Wrapper I.
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Strachan & Henshaw, Ltd.	—
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Thrutchley & Co., Ltd.	Centre IV.
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Underfeed Stoker Co., Ltd.	Centre XII.
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Wood, Hugh, & Co.	—
Woodall-Duckham Company	Centre I.
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Dublin Township Lighting.—The Dalkey (Co. Dublin) Urban Council decided to accept the Alliance and Dublin Consumers' Gas Company's contract for the lighting of 50 public lamps at £360. The Company had offered special terms for a period of three or five years, but the majority of the Council were not in favour of this. On a three years' contract, the charge would have been at £5 per lamp per year, and on a five years' contract £4 per lamp. The recent yearly contract was at £5 9s. 6d. per lamp.

Penistone Gas Company and Competition.—A keen struggle for public favour is in progress between the Penistone (West Riding) Gas Company and the Yorkshire Electric Power Company. It seems that the Electricity Company have now laid their cables through the town; and their representatives are eagerly canvassing the householders. With commendable enterprise, the Gas Company have decided to fight the Electricity Company by lowering the price of gas. This has now been reduced from 1s. 6d. to 1s. 2d. per therm.

Leicester gas is to be reduced to 9d. per therm, or 3s. 4½d. per 1000 c.ft. The pre-war price was 2s. 4d.; and the highest price during the war was 5s. 6d. per 1000 c.ft.

While engaged in removing an obstruction from a coal-breaker at the Cheltenham Gas-Works, Edwin Tandy was drawn, feet foremost, into the claws of the machine. His legs were crushed to pulp before a workmate could give the signal for the engine to be stopped. He died soon afterwards.

A verdict of "Accidental death" was returned, last week, at an inquest at Edlington, near Doncaster, on the bodies of three young brothers—Joseph (13), Arthur (12), and Charles Pass (5)—who had been found dead at home from gas poisoning. The boys all slept in one bed; and the evidence showed that the gas-burner was defective, though the father said he did not know it. The Coroner found no blame attached to the parents, but strongly urged the necessity for village gas-burners being examined.

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NOTICE IS HEREBY ALSO GIVEN that the TRANSFER BOOKS of the ORDINARY SHARES of the Company WILL BE CLOSED from the 11th inst. to the 26th inst.

By order of the Court of Directors,
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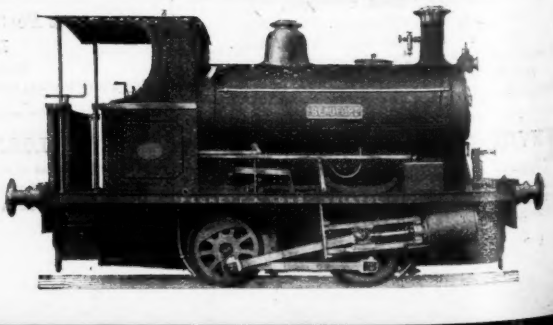
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